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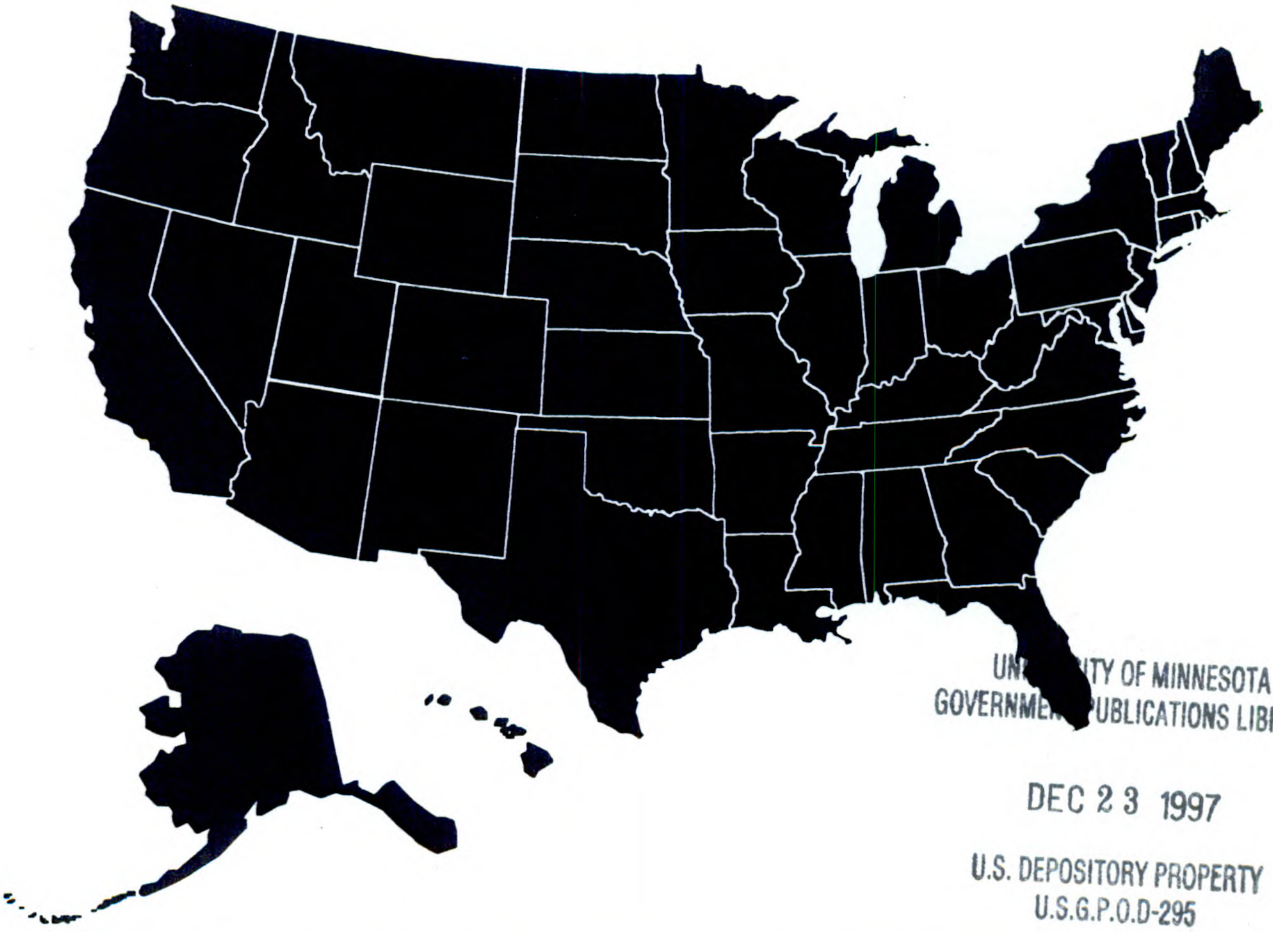
MINERALS YEARBOOK

AREA REPORTS: DOMESTIC 1996

Volume II



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U.S. GEOLOGICAL SURVEY

MINERALS YEARBOOK

AREA REPORTS: DOMESTIC 1996

Volume II

U.S. GEOLOGICAL SURVEY

U.S. DEPARTMENT OF THE INTERIOR
BRUCE BABBIT, ***Secretary***

MARCH 3, 1849

U.S. GEOLOGICAL SURVEY
Gordon P. Eaton, ***Director***

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Foreword

This edition of the U.S. Geological Survey (USGS) Minerals Yearbook discusses the performance of the worldwide minerals and materials industry during 1996, and it provides background information to assist in interpreting that performance. Content of the individual Minerals Yearbook volumes follows:

Volume I, Metals and Minerals, contains chapters about virtually all metallic and industrial mineral commodities important to the U.S. economy. Chapters on survey methods, summary statistics for domestic nonfuel minerals, and trends in mining and quarrying in the metals and industrial mineral industries in the United States are also included.

Volume II, Area Reports: Domestic, contains a chapter on the minerals industry of each of the 50 States and Puerto Rico and the Administered Islands. This volume also has chapters on survey methods and summary statistics for domestic nonfuel minerals.

Volume III, Area Reports: International, is published in four separate reports. These reports collectively contain the latest available mineral data on more than 190 foreign countries and discuss the importance of minerals to the economies of these nations and the United States. Each report begins with an overview of the region's mineral industries during the year. It continues with individual country chapters that examine the mining, refining, processing, and utilization of minerals in each country of the region and how they relate to U.S. industry. Most chapters include production and industry structure tables, information about Government policies and programs affecting the country's minerals industry, and an outlook section.

The USGS continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the Minerals Yearbook are welcomed

Gordon P. Eaton
Director

Contacts

Information about the U.S. Geological Survey, its programs, staff, and products may be accessed by the Internet at http://www.usgs.gov/. Geologic information on topics such as earthquakes, volcanoes, energy, and mineral resources is available by contacting the Geologic Inquiries Group at (703) 648-4383. Map, digital data, and aerial photography products and information are available by contacting the Earth Science Information Center at 1-800-USA-MAPS. Water data and information may be obtained by contacting the Water Information Center at 1-800-426-9000. For specific information about this publication, contact the Chief, Publication Services Section, Minerals Information Team (703) 648-4750. Information about the Minerals Information Team may be accessed by the Internet at http://minerals.er.usgs.gov/minerals/.

Acknowledgments

This volume was written by Arnold Tanner, with assistance from Roger Loebenstein, both physical scientists with the Minerals Information Team (MIT) of the U.S. Geological Survey (USGS). All commodity rankings and statistical analyses were performed by Mr. Tanner and were based on data reported to the USGS by companies responding to the annual canvasses of nonfuel mineral producers in the United States. Mineral production data and related rankings for 1996 are preliminary owing to publication of this volume before final data for all commodities were available. Data and related rankings prior to 1996 are from final tabulations. For crushed stone and construction sand and gravel, each State chapter includes tabular data by State districts, where applicable, based on final 1995 data. Information regarding a State's mining industry, mineral exploration, and other mining-related activities or legislation was derived from information submitted by officials from each participating State. We thank those State agencies that contributed mining and minerals industry information for their States and cite the authors of such information in each chapter as appropriate. Their submissions significantly broadened the scope of those chapters. All chapters underwent technical review by USGS mineral commodity specialists and other agency professionals. The melding of their knowledge and expertise into this project was invaluable in producing accurate individual documents and is greatly appreciated. Previously, all State chapters were published individually under the title "Mineral Industry Surveys." Maps indicating the State's "principal mineral-producing locations" lead off each respective State chapter. The State maps were fully updated and revised in November 1995 in collaboration with the State Geologists and/or minerals information agency Directors for each State. A small number of State maps received a further update for this volume per request by that State. Additionally, all maps were reformatted and standardized for this publication by, and under the direction of, Roger Loebenstein.

The Survey Methods chapter, the Statistical Summary of Nonfuel Minerals chapter, and the tabular material covering total State nonfuel mineral production and construction aggregate production information also were prepared by the MIT. Compilations of data contained in this volume were largely based on statistics and other data provided by the mineral industries. The USGS gratefully acknowledges the willing contribution of these essential data by both companies and individuals.

In the collection of statistical and other mineral industry information, the USGS also was assisted by various State agencies through cooperative memorandum of understanding (MOU) agreements. Some of the chapters in Volume II were reviewed by staff members of these agencies. Our sincere appreciation for all agency cooperation is extended to the State government agencies which had MOU's with the U.S. Bureau of Mines (USBM). The USBM minerals information activities, including State minerals information MOU's, were transferred to the USGS in January 1996. State agencies holding MOU's with the USGS are as follows:

Alabama: Geological Survey of Alabama.
Arizona: Arizona Department of Mines and Mineral Resources.
Arkansas: Arkansas Geological Commission.
California: California Department of Conservation, Division of Mines and Geology.
Colorado: Colorado Geological Survey.
Connecticut: Connecticut Geological and Natural History Survey.
Delaware: Delaware Geological Survey.
Florida: Florida Geological Survey.
Georgia: Georgia Geologic Survey.
Hawaii: Hawaii Division of Water and Land Development.
Idaho: Idaho Geological Survey.
Illinois: Illinois State Geological Survey.
Indiana: Indiana Geological Survey.
Iowa: Iowa Geological Survey Bureau.
Kansas: Kansas Geological Survey.
Kentucky: Kentucky Geological Survey.
Louisiana: Louisiana Geological Survey.

Maine: Maine Geological Survey.
Maryland: Maryland Geological Survey.
Massachusetts: Massachusetts Executive Office of Environmental Affairs.
Michigan: Michigan Department of Natural Resources, Geological Survey Division.
Mississippi: Mississippi Office of Geology, Department of Environmental Quality.
Missouri: Missouri Department of Natural Resources, Division of Geology and Land Survey.
Montana: Montana Bureau of Mines and Geology.
Nebraska: University of Nebraska-Lincoln, Nebraska Geological Survey.
Nevada: Nevada Bureau of Mines and Geology.
New Hampshire: New Hampshire Department of Environmental Services.
New Jersey: New Jersey Geological Survey.
New Mexico: New Mexico Bureau of Mines and Mineral Resources.
New York: New York State Geological Survey.
North Carolina: North Carolina Geological Survey.
North Dakota: North Dakota Geological Survey.
Ohio: Ohio Division of Geological Survey.
Oklahoma: Oklahoma Geological Survey.
Pennsylvania: Pennsylvania Bureau of Topographic and Geologic Survey.
Puerto Rico: Puerto Rico Department of Natural and Environmental Resources, Bureau of Geology.
Rhode Island: Rhode Island Department of Environmental Management, Office of the State Geologist.
South Carolina: South Carolina Geological Survey.
South Dakota: South Dakota Geological Survey.
Tennessee: Tennessee Division of Geology.
Texas: Texas Bureau of Economic Geology, University of Texas at Austin.
Utah: Utah Geological Survey.
Vermont: Vermont Geological Survey, Office of the State Geologist.
Virginia: Virginia Division of Mineral Resources.
Washington: Washington State Division of Geology and Earth Resources
West Virginia: West Virginia Geological and Economic Survey.
Wisconsin: Wisconsin Geological and Natural History Survey.
Wyoming: Geological Survey of Wyoming.

John H. DeYoung, Jr.
Chief Scientist, Minerals Information Team

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SURVEY METHODS FOR NONFUEL MINERALS

By Kenneth W. Mlynarski

The U.S. Geological Survey (USGS) Minerals Information Team collects worldwide data on virtually every commercially important nonfuel mineral commodity. These data form the base for tracking and assessing the health of the minerals sector of the U.S. economy.

The USGS data collection activity was instituted by the 47th Congress in an appropriations act of August 7, 1882 (22 Stat. 329), which placed the collection of mineral statistics on an annual basis. The most recent authority for the USGS survey activity is the National Materials and Minerals Policy, Research and Development Act of 1980 (Public Law 96-479, 96th Congress). This act strengthens protection for proprietary data provided to the U.S. Department of the Interior by persons or firms engaged in any phase of mineral or mineral-material production or consumption.

Data Collection Surveys

The USGS begins the collection of domestic nonfuel minerals and materials statistics by appraising the information requirements of Government and private organizations of the United States. Requirements that can be met by collecting data from minerals establishments are posed as questions on USGS surveys. Figure 1 shows a typical survey form.

Specific questions about the production, consumption, shipment, and other activities of mineral commodities are structured in the survey forms to provide meaningful aggregated data. Thus, the entire mineral economic cycle from production through consumption is covered by 144 monthly, quarterly, semiannual, and annual surveys.

After the survey form has been designed, a list of the appropriate establishments to be canvassed is developed. Many sources are used to determine which companies, mines, plants, and other operations should be included on the survey mailing list. State geologists, Federal organizations (e.g., Mine Safety and Health Administration), trade associations, industry representatives, and trade publications and directories are some of the sources that are used to develop and update survey listings. With few exceptions, a complete canvass of the list of establishments is employed rather than a sample survey. The iron and steel scrap industry is one of the exceptions where a sample survey is conducted.

The Paperwork Reduction Act requires that any Government agency wanting to collect information from 10 or more individuals or establishments must first obtain approval from the Office of Management and Budget (OMB). OMB approves the need to collect the data and protects industry from unwarranted Government paperwork.

Survey Processing

The USGS surveys approximately 25,000 establishments. Each year, the USGS mails about 40,000 forms that gather information for 144 different surveys. Each completed survey form returned to the USGS undergoes extensive analysis to ensure the highest possible accuracy of the mineral data. The statistical staff monitors all surveys to ensure that errors are not created by reporting in physical units different from the units requested on the form. Relationships between related measures, such as produced crude ore and marketable crude ore, are analyzed for consistency. Engineering relationships, such as recovery factors from ores and concentrates, also are employed. The totals for each form are verified, and currently reported data are checked against prior reports to detect possible errors or omissions.

For the majority of the surveys, which are automated, the forms are reviewed to ensure that data are complete and correct before entering into the computer. The computer is programmed to conduct a series of automated checks to verify mathematical consistency and to identify discrepancies between the data reported and logically acceptable responses.

The USGS is modernizing and automating all of its survey processing and data dissemination functions. Automated commodity data system functions include computerized preparation of statistical tables, the use of desktop publishing to integrate text and tables, and electronic dissemination through the Internet. Also, information on minerals and mineral-related publications is now available through an easy-to-use automated fax response system known as MINES FaxBack.

Survey Responses.—To enable the reader to better understand the basis on which the statistics are calculated, each commodity annual report includes a section entitled "Domestic Data Coverage." This section briefly describes the data sources, the number of establishments surveyed, the response percentage, and the method of estimating the production or consumption for nonrespondents.

To produce reliable aggregated data, the USGS employs efficient procedures for handling instances of nonresponse. Failure to return the initial survey form results in a second mailing of the form. If the second form is not returned, telephone calls are made to the nonrespondents. The followup calls provide the necessary data to complete the survey forms and/or verify questionable data entries. Periodic visits to minerals establishments also are made by USGS commodity specialists to gather missing data and to explain the importance of the establishment's reporting. By describing the use of the published statistics and showing the impact of nonresponse, the USGS strives to encourage respondents to give a complete and accurate reply.

The OMB "Guidelines for Reducing Reporting Burden" stipulates that the minimum acceptable response rate shall be 75% of the panel surveyed. In addition, the USGS strives for a minimum reporting level of 75% of the quantity produced or consumed (depending on the survey) for certain key statistics. Response rates are periodically reviewed. For those surveys not meeting the minimum reporting level, procedures are developed and implemented to improve response rates.

Estimation for Nonresponse.—When efforts to obtain a response to a survey fail, it becomes necessary to employ estimation or imputation techniques to account for missing data. These techniques are most effective when the response rate is relatively high. Some of the estimation methods depend on knowledge of prior establishment reporting, while other techniques rely on external information to estimate the missing data. When survey forms are received after the current publication has been completed, the forms are edited, necessary imputations are made for missing data, and the survey data base is updated. The revised data are reported in later publications.

Protection of Proprietary Data.—The USGS relies on the cooperation of the U.S. minerals industry to provide the mineral data that are presented in this and other USGS publications. Without a strong response to survey requests, the USGS would not be able to present reliable statistics. The USGS, in turn, respects the proprietary nature of the data received from the individual companies and establishments. To ensure that proprietary rights will not be violated, the USGS analyzes each of the aggregated statistics to determine if the data reported by an individual establishment can be deduced from the aggregated statistics. If, for example, there are only two significant producers of a commodity in a given State, the USGS will not publish the State total because either producer could readily estimate the production of the other. It is this obligation to protect proprietary information that results in the "Withheld" or "W" entries in the published tables. However, if a company gives permission in writing, the USGS will publish the data as long as the data from other respondents are protected from disclosure.

International Data

International data are collected by country specialists and data assistants in the Minerals Information Team. The data are gathered from various sources, including published reports of foreign Government mineral and statistical agencies, international organizations, the U.S. Department of State, the United Nations, the Organization of Petroleum Exporting Countries, and personal contact by specialists traveling abroad. Each February, an annual "Minerals Questionnaire" is sent through the Department of State to more than 70 U.S. embassies asking them to provide estimates of mineral production for the host country for the preceding year. Missing data are estimated by USGS country specialists based on historical trends and on specialists' knowledge of current production capabilities in each country.

Publications

The USGS disseminates current and historical minerals information through a broad range of printed publications.

The Minerals Yearbook summarizes annually, on a calendar-year basis, the significant economic and technical developments in the mineral industries. Three separate volumes are issued each year: Volume I, Metals and Minerals; Volume II, Area Reports, Domestic; and Volume III, Area Reports, International. Chapters in Volume I are issued separately as Mineral Industry Surveys (MIS) before the bound volume is available. Volume I of the Minerals Yearbook presents, by mineral commodity, salient statistics on production, trade, consumption, reserves, and other measures of economic activity. Volume II of the Minerals Yearbook reviews the U.S. minerals industry by State and island possessions. Volume III of the Minerals Yearbook contains the latest available mineral data for the year of review on more than 185 foreign countries and discusses the importance of minerals to the economies of these nations.

The MIS contain timely statistical and economic data on minerals. The surveys are designed to keep Government agencies and the public, particularly the mineral industry and the business community, informed of trends in the production, distribution, inventories, and consumption of minerals. Frequency of issue depends on the demand for current data. The MIS are released monthly, quarterly, semiannually, and annually.

Mineral Commodity Summaries, an up-to-date summary of about 80 nonfuel mineral commodities, is the earliest Government publication to furnish estimates covering the previous year's nonfuel mineral industry data. It contains information on the domestic industry structure, Government programs, tariffs, 5-year salient statistics, and a summary of international mining news.

Metal Industry Indicators, published monthly, contains indexes that measure the current and future performance of four U.S. minerals industries. For each of the four industries, a composite coincident index and a composite leading index have been developed based on procedures and data similar to those used to construct the U.S. Department of Commerce's coincident and leading cyclical indicators for the national economy.

The MIS and the Metal Industry Indicators are available at no charge from Publication Distribution, Cochrans Mill Road, P.O. Box 18070, Pittsburgh, PA 15236, (412) 892-4338.

Minerals Yearbooks and Mineral Commodity Summaries may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, (202) 512-1800.

Mineral Commodity Summaries also may be purchased from the National Technical Information Service, Springfield, VA 22161, 1-800-553-NTIS (in Virginia and foreign countries: 1-703-487-4650).

Some Minerals Information publications are also available on a CD-ROM format. The CD-ROM is updated three times per year. It is available from the Government Printing Office at the address and phone number listed above.

Electronic Data Dissemination

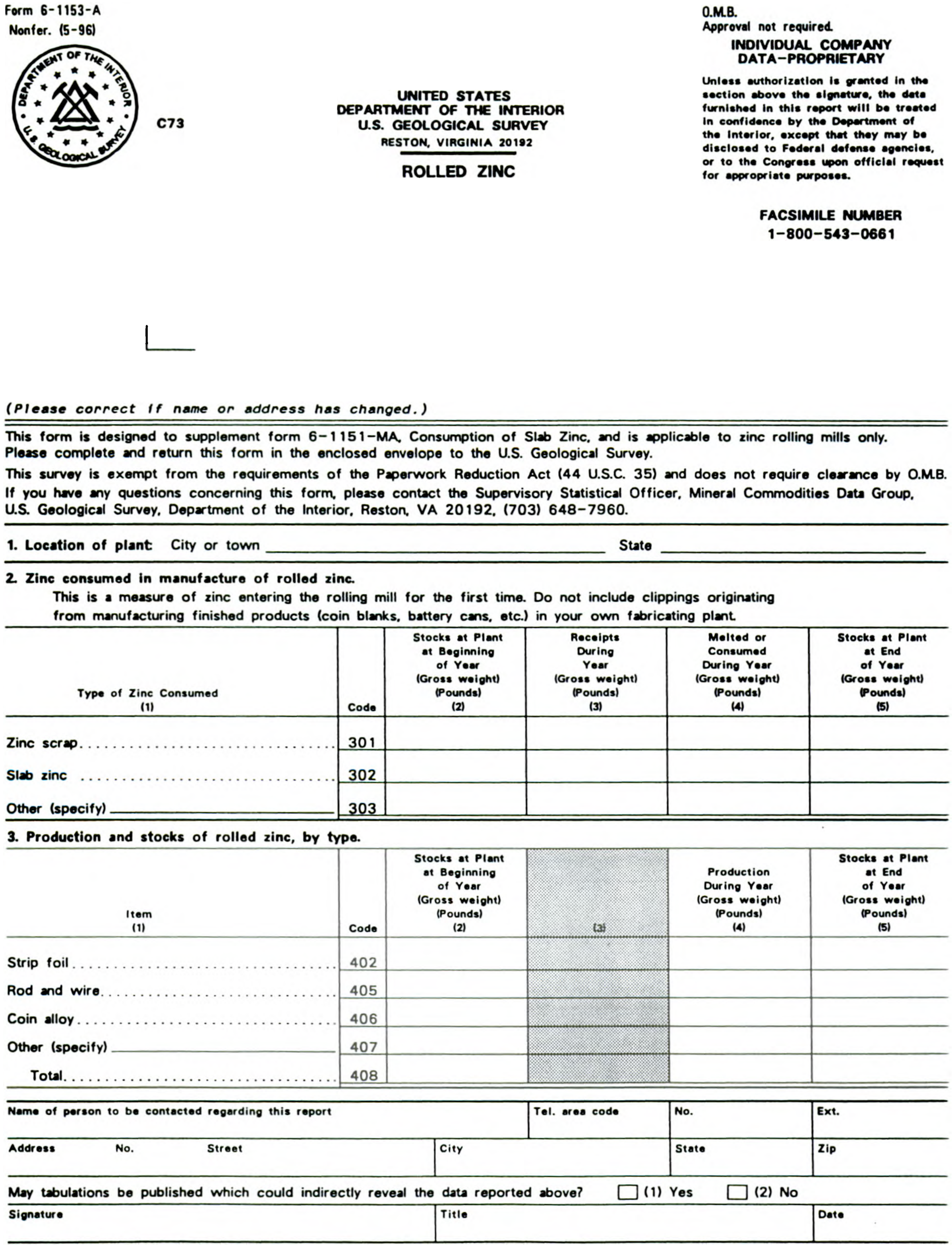
In addition to the USGS's printed publications, current information on minerals and mineral-related publications from the USGS is now available through an easy-to-use automated fax response system. The MINES-FaxBack service allows callers to retrieve information and order some publications for delivery to their fax machines in minutes, 24 hours per day, 7 days per week. MINES-FaxBack makes monthly and quarterly MIS publications available to the public at the same time they are forwarded to the printer.

MINES-FaxBack works from any Group III-compatible fax machine equipped with a touch-tone telephone (either a built-in handset with touch-tone capability or a separate touch-tone telephone plugged into the fax machine's phone jack). After calling MINES FaxBack, the requestor is guided by a series of voice messages that assist the caller in ordering the desired documents. The caller pays for the phone call that also includes the time needed to deliver the requested document to the caller's fax machine.

To access the MINES-FaxBack System, use a touch-tone handset attached to a fax machine or connect a touch-tone telephone to the fax machine's telephone jack and dial (703) 648-4999. Listen to the menu options and select an option using the touch-tone telephone. After completing a selection, press the start button on the fax machine.

The Minerals Information Team also has a page on the World Wide Web detailing its publications, information products, and contacts. To access the page, use Netscape or a similar Web browser. The URL is http://www.minerals.er.usgs.gov/minerals/. The page also contains links to other mining-related pages on the Internet.

FIGURE 1
A TYPICAL SURVEY FORM



Form 6-1153-A
Nonfer. (5-96)

C73

UNITED STATES
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
RESTON, VIRGINIA 20192

ROLLED ZINC

O.M.B.
Approval not required.

INDIVIDUAL COMPANY
DATA-PROPRIETARY

Unless authorization is granted in the section above the signature, the data furnished in this report will be treated in confidence by the Department of the Interior, except that they may be disclosed to Federal defense agencies, or to the Congress upon official request for appropriate purposes.

FACSIMILE NUMBER
1-800-543-0661

(Please correct if name or address has changed.)

This form is designed to supplement form 6-1151-MA, Consumption of Slab Zinc, and is applicable to zinc rolling mills only. Please complete and return this form in the enclosed envelope to the U.S. Geological Survey.

This survey is exempt from the requirements of the Paperwork Reduction Act (44 U.S.C. 35) and does not require clearance by O.M.B. If you have any questions concerning this form, please contact the Supervisory Statistical Officer, Mineral Commodities Data Group, U.S. Geological Survey, Department of the Interior, Reston, VA 20192, (703) 648-7960.

1. Location of plant: City or town ______________________ State ______________________

2. Zinc consumed in manufacture of rolled zinc.
This is a measure of zinc entering the rolling mill for the first time. Do not include clippings originating from manufacturing finished products (coin blanks, battery cans, etc.) in your own fabricating plant.

Type of Zinc Consumed (1)	Code	Stocks at Plant at Beginning of Year (Gross weight) (Pounds) (2)	Receipts During Year (Gross weight) (Pounds) (3)	Melted or Consumed During Year (Gross weight) (Pounds) (4)	Stocks at Plant at End of Year (Gross weight) (Pounds) (5)
Zinc scrap................................	301				
Slab zinc	302				
Other (specify) ______________	303				

3. Production and stocks of rolled zinc, by type.

Item (1)	Code	Stocks at Plant at Beginning of Year (Gross weight) (Pounds) (2)	(3)	Production During Year (Gross weight) (Pounds) (4)	Stocks at Plant at End of Year (Gross weight) (Pounds) (5)
Strip foil................................	402		▨		
Rod and wire............................	405		▨		
Coin alloy................................	406		▨		
Other (specify) ______________	407		▨		
Total.....................................	408		▨		

Name of person to be contacted regarding this report	Tel. area code	No.	Ext.
Address No. Street	City	State	Zip

May tabulations be published which could indirectly reveal the data reported above? ☐ (1) Yes ☐ (2) No

Signature	Title	Date

PRELIMINARY STATISTICAL SUMMARY

By Stephen D. Smith

This preliminary report summarizes data on crude nonfuel mineral production for the United States, its island possessions, and the Commonwealth of Puerto Rico.

Although crude mineral production may be measured at any of several stages of extraction and processing, the stage of measurement used in this annual report is what is termed "mine output." This term refers to minerals or ores in the form in which they are first extracted from the ground, but customarily may include the output from auxiliary processing at or near the mines.

Because of inadequacies in the statistics available, some series deviate from the foregoing definition. For copper, gold, lead, silver, tin, and zinc, the quantities shown are recorded on a mine basis (as the recoverable content of ore sold or treated). However, the preliminary values assigned to the quantities are based on the average selling price of refined metal, not the mine value. Mercury is measured as recovered metal and valued at the average New York price for the metal. Values shown are in current dollars, with no adjustments made to compensate for changes in the purchasing power of the dollar.

The preliminary total value of all nonfuel mineral production in the United States decreased less than 1% to $38.2 billion in 1996, with metals decreasing slightly over 6% to $13.2 billion and industrial minerals rising almost 3% to $25.1 billion over that of 1995. Eight of the mineral commodities produced in the United States in 1995 had an individual total production value greater than $1 billion. These commodities, in descending order, were: stone (crushed), cement (portland), copper, sand and gravel (construction), gold, iron ore, clays, and lime. They composed over 78% of the U.S. total production. (*See table 1.*)

In 1996, eleven States produced nonfuel mineral commodities with individual total production values of greater than $1 billion. These States, in descending order, were: Arizona, Nevada, California, Minnesota, Texas, Georgia, Utah, Florida, Michigan, Missouri, and Pennsylvania. They composed 57% of the U.S. total production. (*See table 4.*)

TABLE 1
NONFUEL MINERAL PRODUCTION 1/ IN THE UNITED STATES 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1994		1995		1996 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
Metals:							
Beryllium concentrates	metric tons	4,330	5	5,040	6	5,430	6
Copper 3/		1,810	4,430,000	1,850	5,640,000	1,900	4,520,000
Gold 3/	kilograms	327,000	4,050,000	320,000	3,990,000	325,000	4,080,000
Iron ore (usable)		57,600	1,580,000	61,100	1,710,000	61,000	2,070,000
Iron oxide pigments (crude)	metric tons	46,400	6,010	51,700	6,720	55,000	7,230
Lead 3/	do.	363,000	298,000	386,000	359,000	430,000	463,000
Magnesium metal	do.	128,000	389,000	142,000	476,000	143,000	514,000
Molybdenum 4/	do.	46,000	284,000	W	W	W	W
Nickel ore	do.	--	--	1,560	W	-- 5/	-- 5/
Palladium	kilograms	6,440	29,400	5,260	22,000	5,000	21,700
Platinum	do.	1,960	25,300	1,590	20,800	1,600	21,100
Rare-earth metal concentrates	metric tons	W	W	22,200	W	22,200	W
Silver 3/	do.	1,490	253,000	1,640	271,000	1,800	307,000
Zinc 3/	do.	570,000	619,000	614,000	756,000	620,000	697,000
Combined value of antimony, bauxite, manganiferous ore, mercury, titanium concentrates, tungsten, vanadium, zircon concentrates and values indicated by symbol W		XX	147,000	XX	812,000	XX	471,000
Total metals		XX	12,100,000	XX	14,100,000	XX	13,200,000
Industrial minerals (excluding fuels):							
Asbestos	metric tons	10,100	5,120	W	W	9,160	W
Barite		583	19,100	543	17,300	650	23,600
Boron minerals (B2O3)	metric tons	1,110,000	443,000	796,000	372,000	622,000	498,000
Bromine	do.	195,000	155,000	218,000	186,000	227,000	150,000
Cement:							
Masonry		3,610	286,000	3,600	307,000	3,590	307,000

See footnotes at end of table.

TABLE 1--Continued
NONFUEL MINERAL PRODUCTION 1/ IN THE UNITED STATES 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1994		1995		1996 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
Metals--Continued:							
Cement--Continued:							
Portland		74,300	4,460,000	73,300	4,920,000	75,000	5,030,000
Clays		42,200	1,600,000	43,100	1,730,000	44,000	1,700,000
Diatomite		613	152,000	687	171,000	700	174,000
Feldspar	metric tons	765,000	31,200	882,000	37,400	900,000	38,200
Garnet (industrial)	do.	51,000	6,100	53,000	10,000	54,300	10,400
Gemstones		NA	50,500	NA	74,400	NA	61,500
Gypsum (crude)		17,200	115,000	16,600	121,000	17,000	128,000
Helium:							
Crude	million cubic meters	39	38,500	36	32,100	36	32,800
Grade-A	do.	100	199,000	99	196,000	101	200,000
Iodine	metric tons	1,630	12,800	1,220	12,500	1,170	15,800
Lime		17,400	1,020,000	18,500	1,100,000	18,900	1,120,000
Mica (scrap)		110	5,780	108	5,630	109	6,650
Peat		552	15,300	660 6/	17,000 6/	667 6/	16,900 6/
Perlite	metric tons	644,000	19,400	700,000	21,600	701,000	20,400
Phosphate rock		41,100	869,000	43,500	947,000	42,500	870,000
Potash (K2O)		2,970	284,000	2,880	284,000	2,810	265,000
Pumice and pumicite	metric tons	490,000	11,800	529,000	13,200	465,000	10,900
Salt		39,700	990,000	40,800	1,000,000	40,100	927,000
Sand and gravel:							
Construction		891,000	3,740,000	910,000	3,910,000	963,000	4,270,000
Industrial		27,300	488,000	28,200	502,000	28,600	502,000
Silica stone 7/	metric tons	514	3,990	374	2,970	W	W
Sodium compounds:							
Soda ash		9,320	724,000	10,100	829,000	10,100	778,000
Sodium sulfate (natural)		298	24,200	327	27,700	325	22,000
Stone (crushed) 8/		1,230,000	6,620,000	1,260,000	6,750,000	1,300,000	7,070,000
Sulfur (Frasch)		3,010	162,000	3,070	207,000	W	W
Tripoli	metric tons	82,300	10,900	80,100	10,500	W	W
Vermiculite	do.	177,000	14,200	171,000	W	W	W
Zeolites	do.	57,600	NA	46,800	NA	NA	NA
Combined value of brucite, emery, fluorspar, greensand marl, kyanite, lithium minerals, magnesite, magnesium compounds, olivine, staurolite, stone (dimension), sulfur (Frasch), talc and pyrophyllite, wollastonite, and values indicated by symbol W		XX	531,000	XX	622,000	XX	833,000
Total industrial minerals		XX	23,100,000	XX	24,400,000	XX	25,100,000
Grand total		XX	35,200,000	XX	38,500,000	XX	38,200,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value." XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Recoverable content of ores, etc.

4/ Content of ore and concentrate.

5/ The mine on Nickel Mountain was on care and maintenance basis in 1996.

6/ Data series changed to production beginning in 1995; prior years shipment data may not be comparable.

7/ Includes grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

8/ Excludes abrasive stone and bituminous limestone and sandstone; all included elsewhere in table.

TABLE 2
NONFUEL MINERALS PRODUCED IN THE UNITED STATES, BY COMMODITY AND STATES IN 1996 p/

(Based on quantity unless otherwise noted)

Mineral	Principal States	Other States
Antimony 1/	ID	
Asbestos	CA	
Barite	NV, GA, MO, TN, IL	
Bauxite	AL	
Beryllium concentrate	UT	
Boron (B2O3)	CA	
Bromine	AR and MI	
Brucite	NV	
Cement:		
Masonry	FL, IN, MD, AL, SC	All other States except AK, CT, DE, IL, LA, MA, MN, MS, NV, NH, NJ, NM, NC, ND, OR, RI, VT, WI, WY.
Portland	CA, TX, MI, PA, MO	All other States except AK, CT, DE, LA, MA, MN, NH, NJ, NC, ND, RI, VT, WI.
Clays	GA, AL, WY, TX, NC	All other States except AK, DE, HI, RI, VT, WI.
Copper 1/	AZ, UT, NM, MT, NV	ID, IL, MO, WI.
Diatomite	CA, NV, WA, OR, CA	
Emery	OR	
Feldspar	NC, VA, CA, OK, GA	ID and SD.
Fluorspar	IL	
Garnet (abrasive)	NY and ID	
Gemstones (natural) 2/	AL, TN, AR, IA, AZ	All other States.
Gold 1/	NV, CA, UT, SD, MT	AK, AZ, CO, ID, NM, SC, WA, WI.
Greensand marl	NJ	
Gypsum (crude)	OK, IA, TX, NV, CA	AZ, AR, CO, IN, KS, LA, MI, NM, NY, OH, UT, VA, WY.
Helium (crude and Grade-A)	KS, WY, UT, TX, CO	OK.
Iodine	OK	
Iron ore (usable)	MN, MI, MO, UT, NM	CA, MT, SD.
Iron oxide pigments (crude)	MI, MO, GA, VA, AL	AZ.
Kyanite	VA	
Lead 1/	MO, AK, ID, MT, CO	NY.
Lime	MO, OH, KY, AL, PA	All other States except AK, CT, DE, FL, GA, HI, KS, ME, MD, MS, NH, NJ, NM, NY, NC, RI, SC, VT.
Lithium minerals	NC and NV	
Magnesite	NV	
Magnesium compounds	MI, CA, FL, UT, DE	TX.
Magnesium metal	TX, WA, UT	
Manganiferous ore	SC	
Mercury	NV, CA, UT	
Mica (scrap)	NC, NM, GA, SC, SD	
Molybdenum	AZ, UT, CO, ID, MT	NM.
Olivine	WA and NC	
Palladium metal	MT	
Peat	FL, MI, IL, NC, MN	CO, IN, IA, ME, MA, MT, NJ, NY, ND, OH, PA, SC, WA, WV, WI.
Perlite	NM, AZ, CA, NV	
Phosphate rock	FL, ID, NC, UT	
Platinum metal	MT	
Potash	NM, UT, MI, CA	
Pumice and pumicite	OR, NM, CA, ID, KS	AZ.
Rare-earth metal concentrates	CA	
Salt	LA, TX, OH, NY, KS	AL, AZ, CA, MI, NV, NM, OK, UT, WV.
Sand and gravel:		
Construction	CA, TX, MI, OH, AZ	All other States.
Industrial	IL, MI, NJ, CA, WI	All other States except AK, CT, DE, HI, KY, MA, ME, NH, NM, OR, SD, UT, VT, WY.
Silica stone 3/	AR and WI.	
Silver 1/	NV, AZ, ID, UT, AK	CA, CO, MO, MT, NV, NM, NY, SC, SD, UT, WI.
Sodium compounds:		
Soda ash	WY and CA	
Sodium sulfate (natural)	CA and TX	
Staurolite	FL	

See footnotes at end of table.

TABLE 2--Continued
NONFUEL MINERALS PRODUCED IN THE UNITED STATES, BY COMMODITY AND STATES IN 1996 p/

(Based on quantity unless otherwise noted)

Mineral	Principal States	Other States
Stone:		
Crushed	TX, PA, FL, MO, IL	All other States except DE and ND.
Dimension	IN, GA, WI, MA, VT	All other States except AK, DE, FL, HI, IL, KY, LA, MS, NE, NV, NJ, ND, OR, RI, WY.
Talc and pyrophyllite	MT, TX, NY, VT, NC	CA, OR, VA.
Titanium concentrates	FL	
Tripoli	IL, OK, AR, PA	
Tungsten 1/	CA	
Vanadium 1/	ID	
Vermiculite (crude)	SC and VA	
Wollastonite	NY	
Zinc 1/	AK, TN, NY, MO, MT	CO, IL, ID.
Zircon concentrates	FL	

p/ Preliminary.
1/ Content of ores, etc.
2/ Principal producing States based on value.
3/ Includes grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

TABLE 3
VALUE OF NONFUEL MINERAL PRODUCTION IN THE UNITED STATES AND PRINCIPAL NONFUEL MINERALS PRODUCED IN 1996 p/ 1/

State	Value (thousands)	Rank	Percent of U.S. total	Principal minerals, in order of value
Alabama	$735,000	17	1.92	Cement (portland), stone (crushed), lime, sand and gravel (construction), clays.
Alaska 2/	523,000	25	1.37	Zinc, lead, gold, sand and gravel (construction), stone.
Arizona	3,530,000	1	9.23	Copper, sand and gravel (construction), cement (portland), molybdenum, lime.
Arkansas	453,000	29	1.18	Stone (crushed), bromine, cement (portland), sand and gravel (construction), gemstones.
California	2,840,000	3	7.42	Sand and gravel (construction), cement (portland), boron minerals, gold, stone (crushed).
Colorado	528,000	23	1.38	Sand and gravel (construction), cement (portland), molybdenum, stone (crushed), gold.
Connecticut	103,000	44	0.27	Stone (crushed), sand and gravel (construction), stone (dimension), clays, gemstones.
Delaware 2/	10,700	50	0.03	Sand and gravel (construction), magnesium compounds, gemstones.
Florida	1,540,000	8	4.02	Phosphate rock, stone (crushed), cement (portland), sand and gravel (construction), clays.
Georgia	1,720,000	6	4.50	Clays, stone (crushed), cement (portland), stone (dimension), sand and gravel (construction).
Hawaii 2/	112,000	43	0.29	Stone (crushed), cement (portland), sand and gravel (construction), cement (masonry), gemstones.
Idaho	411,000	32	1.08	Gold, phosphate rock, molybdenum, sand and gravel (construction), silver.
Illinois	817,000 r/	16	2.14	Stone (crushed), cement (portland), sand and gravel (construction), sand and gravel (industrial), clays.
Indiana	617,000	21	1.61	Stone (crushed), cement (portland), sand and gravel (construction), lime, cement (masonry).
Iowa	486,000 r/	28	1.27	Stone (crushed), cement (portland), sand and gravel (construction), gypsum, lime.
Kansas	524,000	24	1.37	Cement (portland), helium (Grade-A), stone (crushed), salt, sand and gravel (construction).
Kentucky	453,000 r/	30	1.19	Stone (crushed), lime, cement (portland), sand and gravel (construction), clays.
Louisiana	428,000	31	1.12	Salt, sulfur (Frasch), sand and gravel (construction), stone (crushed), sand and gravel (industrial).
Maine	73,100	45	0.19	Sand and gravel (construction), cement (portland), stone (crushed), cement (masonry), peat.
Maryland 2/	324,000	36	0.85	Stone (crushed), cement (portland), sand and gravel (construction), cement (masonry), stone (dimension).
Massachusetts	191,000	39	0.50	Sand and gravel (construction), stone (crushed), stone (dimension), lime, clays.
Michigan	1,510,000	9	3.94	Iron ore (usable), cement (portland), sand and gravel (construction), magnesium compounds, stone (crushed), salt.
Minnesota	1,800,000	4	4.71	Iron ore (usable), sand and gravel (construction), stone (crushed), sand and gravel (industrial), stone (dimension).
Mississippi	140,000	42	0.36	Sand and gravel (construction), clays, cement (portland), stone (crushed), sand and gravel (industrial).
Missouri	1,250,000	10	3.27	Lead, stone (crushed), cement (portland), lime, zinc.
Montana	523,000	26	1.37	Gold, copper, cement (portland), zinc, sand and gravel (construction).
Nebraska	147,000	41	0.38	Cement (portland), sand and gravel (construction), stone (crushed), clays, cement (masonry).
Nevada	3,230,000 r/	2	8.46	Gold, silver, sand and gravel (construction), copper, diatomite.
New Hampshire 2/	43,900	47	0.11	Sand and gravel (construction), stone (crushed), stone (dimension), clays, gemstones.
New Jersey 2/	222,000	38	0.58	Stone (crushed), sand and gravel (construction), sand and gravel (industrial), greensand marl, peat.
New Mexico	963,000	12	2.52	Copper, potash, sand and gravel (construction), cement (portland), stone (crushed).
New York	891,000	15	2.33	Stone (crushed), cement (portland), salt, sand and gravel (construction), zinc.
North Carolina	731,000	18	1.91	Stone (crushed), phosphate rock, lithium minerals, sand and gravel (construction), sand and gravel (industrial).
North Dakota	30,300	49	0.08	Sand and gravel (construction), lime, clays, sand and gravel (industrial), gemstones.
Ohio	934,000	13	2.44	Stone (crushed), salt, sand and gravel (construction), lime, cement (portland).
Oklahoma	372,000	34	0.97	Stone (crushed), cement (portland), sand and gravel (construction), sand and gravel (industrial), gypsum.
Oregon	251,000	37	0.66	Stone (crushed), sand and gravel (construction), cement (portland), lime, diatomite.
Pennsylvania 2/	1,040,000	11	2.72	Stone (crushed), cement (portland), lime, sand and gravel (construction), cement (masonry).
Rhode Island 2/	31,900	48	0.08	Sand and gravel (construction), stone (crushed), sand and gravel (industrial), gemstones.
South Carolina	495,000	27	1.29	Cement (portland), stone (crushed), gold, sand and gravel (construction), cement (masonry).
South Dakota	353,000	35	0.92	Gold, cement, (portland), sand and gravel (construction), stone (crushed), stone (dimension).
Tennessee	651,000 r/	19	1.70	Stone (crushed), zinc, cement (portland), sand and gravel (construction), clays.
Texas	1,780,000	5	4.66	Cement (portland), sand and gravel (construction), stone (crushed), magnesium metal), lime.
Utah	1,560,000	7	4.08	Copper, gold, magnesium metal, sand and gravel (construction), molybdenum.
Vermont 2/	66,800	46	0.17	Sand and gravel (construction), stone (dimension), stone (crushed), talc and pyrophyllite, gemstones.
Virginia	529,000	22	1.38	Stone (crushed), cement (portland), sand and gravel (construction), lime, kyanite.
Washington	626,000	20	1.64	Sand and gravel (construction), magnesium metal, cement (portland), stone (crushed), gold.
West Virginia	191,000	40	0.50	Stone (crushed), cement (portland), sand and gravel (construction), lime, salt.
Wisconsin	399,000	33	1.04	Stone (crushed), sand and gravel (construction), copper, sand and gravel (industrial), lime.
Wyoming	918,000	14	2.40	Soda ash, clays, helium (Grade-A), cement (portland), stone (crushed).
Undistributed	145,000	XX	0.38	
Total	38,200,000	XX	100.00	

p/ Preliminary. r/ Revised. XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Partial total; excludes values that must be concealed to avoid disclosing company proprietary data. Concealed values included with "Undistributed."

TABLE 4
VALUE OF NONFUEL MINERAL PRODUCTION PER CAPITA AND PER SQUARE KILOMETER IN 1996, BY STATE p/ 1/

State	Area (square kilometers)	Population (thousands)	Total value (thousands)	Per capita		Per square kilometer	
				Dollars	Rank	Dollars	Rank
Alabama	134,000	4,250	$735,000	173	15	5,490	23
Alaska	1,530,000	604	523,000 2/	866	3	342	49
Arizona	295,000	4,220	3,530,000	837	4	12,000	1
Arkansas	138,000	2,480	453,000	182	14	3,290	31
California	411,000	31,600	2,840,000	90	32	6,900	17
Colorado	270,000	3,750	528,000	141	18	1,960	40
Connecticut	13,000	3,270	103,000	31	48	7,920	13
Delaware	5,290	717	10,700 2/	15	50	2,020	39
Florida	152,000	14,200	1,540,000	108	25	10,100	7
Georgia	153,000	7,200	1,720,000	239	11	11,300	4
Hawaii	16,800	1,190	112,000 2/	95	31	6,700	18
Idaho	216,000	1,160	411,000	353	10	1,900	41
Illinois	146,000	11,800	817,000 r/	69	39	5,600	22
Indiana	93,700	5,800	617,000	106	26	6,580	19
Iowa	146,000	2,840	486,000 r/	171	16	3,330	30
Kansas	213,000	2,570	524,000	204	13	2,460	37
Kentucky	105,000	3,860	453,000 r/	117	21	4,330	26
Louisiana	124,000	4,340	428,000	99	29	3,460	29
Maine	86,200	1,240	73,100	59	41	848	47
Maryland	27,100	5,040	324,000 2/	64	40	12,000	2
Massachusetts	21,500	6,070	191,000	32	47	8,900	9
Michigan	152,000	9,550	1,510,000	158	17	9,950	8
Minnesota	219,000	4,610	1,800,000	390	9	8,230	12
Mississippi	124,000	2,700	140,000	52	42	1,130	45
Missouri	181,000	5,320	1,250,000	235	12	6,930	16
Montana	381,000	870	523,000	601	6	1,370	44
Nebraska	200,000	1,640	147,000	90	33	734	48
Nevada	286,000	1,530	3,230,000 r/	2,110	1	11,300	3
New Hampshire	24,000	1,150	43,900 2/	38	45	1,820	42
New Jersey	20,200	7,950	222,000 2/	28	49	11,000	5
New Mexico	315,000	1,690	963,000	571	7	3,060	32
New York	127,000	18,100	891,000	49	43	7,000	15
North Carolina	136,000	7,200	731,000	102	28	5,360	24
North Dakota	183,000	641	30,300	47	44	166	50
Ohio	107,000	11,200	934,000	84	35	8,730	11
Oklahoma	181,000	3,280	372,000	114	24	2,060	38
Oregon	251,000	3,140	251,000	80	37	998	46
Pennsylvania	117,000	12,100	1,040,000 2/	86	34	8,850	10
Rhode Island	3,140	990	31,900 2/	32	46	10,100	6
South Carolina	80,600	3,670	495,000	135	19	6,140	20
South Dakota	200,000	729	353,000	484	8	1,770	43
Tennessee	109,000	5,260	651,000 r/	124	20	5,970	21
Texas	691,000	18,700	1,780,000	95	30	2,580	36
Utah	220,000	1,950	1,560,000	799	5	7,090	14
Vermont	24,900	585	66,800 2/	114	23	2,680	35
Virginia	106,000	6,620	529,000	80	36	5,010	25
Washington	176,000	5,430	626,000	115	22	3,550	28
West Virginia	62,800	1,830	191,000	104	27	3,040	33
Wisconsin	145,000	5,120	399,000	78	38	2,740	34
Wyoming	253,000	480	918,000	1,910	2	3,620	27
Undistributed	XX	XX	145,000	XX	XX	XX	XX
Total or average	9,370,000 3/	262,000 3/	38,200,000	146	XX	4,080	XX

p/ Preliminary. r/ Revised. XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Partial total; excludes values that must be concealed to avoid disclosing company proprietary data. Concealed values included with "Undistributed."

3/ Excludes Washington, DC (which has no mineral production), with an area of 179 square kilometers and a population of 554,000.

Sources: U.S. Geological Survey and Bureau of the Census.

TABLE 5
NONFUEL RAW MINERAL PRODUCTION 1/ IN THE UNITED STATES, BY STATE 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1994		1995		1996 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
Alabama:							
Cement:							
Masonry		312	28,900	306	30,700	317	31,800
Portland		3,980	248,000	4,090	285,000	4,140	288,000
Clays		2,280 3/	25,400 3/	2,690	33,700	3,360	35,200
Gemstones		NA	W	NA	16,000	NA	W
Lime		1,660	88,300	1,730	105,000	1,760	107,000
Sand and gravel:							
Construction		12,500	47,600	11,900	49,400	13,000	55,900
Industrial		610	7,160	479	5,940	475	5,870
Stone (crushed)		32,500	164,000	33,600	174,000	35,500	186,000
Combined value of bauxite, clays [bentonite (1994)], iron oxide pigments [crude (1996)], salt, and stone [dimension limestone, marble and sandstone (1994), dimension limestone and sandstone (1995-96)], and values indicated by symbol W		XX	16,500	XX	6,810	XX	25,100
Total		XX	626,000	XX	706,000	XX	735,000
Alaska:							
Gemstones		NA	10	NA	10	NA	11
Gold 4/	kilograms	5,660 5/	70,300 5/	4,410 5/	56,000 5/	4,500	56,400
Sand and gravel (construction)		15,700	56,200	13,700	48,500	14,000	51,100
Silver 4/	metric tons	W	W	109	18,100	130	22,200
Stone (crushed)		3,870	24,100	3,320 6/	20,400 6/	3,500 6/	22,200 6/
Zinc 4/	metric tons	W	W	321,000	395,000	330,000	371,000
Combined values of lead, stone [crushed dolomite and limestone (1995-96)], and value indicated by symbol W		XX	367,000	XX	(7/)	XX	(7/)
Total		XX	518,000	XX	538,000 8/	XX	523,000 8/
Arizona:							
Clays		98 3/	452 3/	119	449 3/	120	454 3/
Copper 4/		1,120	2,750,000	1,170	3,560,000	1,230	2,930,000
Gemstones		NA	3,550	NA	3,230	NA	4,010
Gold 4/	kilograms	2,050	25,300	1,920	23,900	2,100	26,300
Iron oxide pigments (crude)	metric tons	77	62	68	90	W	W
Sand and gravel:							
Construction		34,800	166,000	40,100	201,000	41,900	220,000
Industrial		W	W	334	2,910	332	3,310
Silver 4/	metric tons	198	33,700	220	36,400	240	40,900
Stone (crushed)		4,970	25,000	5,520	32,600	5,600	33,600
Combined value of cement, clays (bentonite), gypsum (crude), lime, molybdenum, perlite (crude), pumice and pumicite, salt, stone (dimension sand stone), and value indicated by symbol W		XX	274,000	XX	331,000	XX	274,000
Total		XX	3,280,000	XX	4,190,000	XX	3,530,000
Arkansas:							
Clays 3/		883	2,440	1,160	7,810	1,330	5,460
Gemstones		NA	3,950	NA	4,890	NA	W
Sand and gravel:							
Construction		10,600	42,500	11,600	48,300	11,300	46,300
Industrial		684	8,230	W	W	W	W
Silica stone 9/	metric tons	510	3,940	W	W	W	W
Stone:							
Crushed		20,800 6/	122,000 6/	25,500	169,000	26,200	176,000
Dimension	metric tons	W	W	22,000	2,010	24,300	2,010

See footnotes at end of table.

TABLE 5--Continued
NONFUEL RAW MINERAL PRODUCTION 1/ IN THE UNITED STATES, BY STATE 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

		1994		1995		1996 p/	
Mineral		Quantity	Value	Quantity	Value	Quantity	Value
Arkansas--Continued:							
Combined value of bromine, cement, clays [fire, kaolin (1994)], gypsum (crude), lime, stone [crushed limestone and traprock (1994), dimension limestone, marble, and sandstone (1994)], tripoli and values indicated by symbol W		XX	254,000	XX	260,000	XX	224,000
Total		XX	437,000	XX	492,000	XX	453,000
California:							
Asbestos	metric tons	8,990	4,200	W	W	9,160	W
Boron minerals (B2O3)	do.	550,000	443,000	796,000	372,000	622,000	498,000
Cement:							
Masonry		99	6,830	154	11,200	161	11,700
Portland		9,640	539,000	9,360	565,000	9,780	589,000
Clays 3/		1,570	20,600	1,810	28,800	1,620	25,800
Diatomite		W	W	318	W	322	W
Gemstones		NA	1,710	NA	490	NA	468
Gold 4/	kilograms	30,100	373,000	26,200	326,000	26,000	326,000
Lime		203	16,900	228	15,600	172	11,700
Rare-earth metal concentrates	metric tons	20,700	W	22,200	W	22,200	W
Sand and gravel:							
Construction		96,300	523,000	98,400	542,000	112,000	646,000
Industrial		1,740	39,400	1,710	38,300	1,690	39,400
Silver 4/	metric tons	11	1,910	13	2,100	28	4,770
Stone:							
Crushed		41,100	258,000	43,700 6/	268,000 6/	46,200 6/	286,000
Dimension	metric tons	11,100 6/	4,030 6/	27,300	6,660	30,300	6,700
Combined value of clays (fuller's earth, kaolin), copper (1996), feldspar, gypsum (crude), iron ore (usable), magnesium compounds, mercury, perlite (crude), potash, pumice and pumicite, salt, soda ash, sodium sulfate (natural), stone [crushed dolomite and shell (1995-96), dimension limestone, sandstone, slate and miscellaneous (1994)], talc and pyrophyllite, titanium [ilmenite (1994)], tungsten, and values indicated by symbol W		XX	364,000	XX	399,000	XX	391,000
Total		XX	2,590,000	XX	2,580,000	XX	2,840,000
Colorado:							
Clays		291	2,320	294	2,050 3/	324 3/	1,980 3/
Gemstones		NA	267	NA	245	NA	247
Gold 4/	kilograms	4,420	54,700	W	W	W	W
Sand and gravel (construction)		29,000	109,000	34,100	141,000	38,200	164,000
Stone:							
Crushed		8,260 6/	52,300 6/	9,000	58,500	9,800	64,700
Dimension	metric tons	3,630 6/	51 6/	17,800	2,640	12,100	2,250
Combined value of cement, clays [fire (1996), kaolin (1995-96)], gypsum (crude), helium (Grade-A), lead, lime, molybdenum, peat, sand and gravel (industrial), silver, stone [crushed traprock and volcanic cinder (1994), dimension marble (1994)], zinc, and values indicated by symbol W		XX	192,000	XX	366,000	XX	295,000
Total		XX	410,000	XX	570,000	XX	528,000
Connecticut:							
Gemstones		NA	5	NA	5	NA	5
Sand and gravel (construction)		5,420	28,000	6,410	37,500	7,190	43,100
Stone (crushed)		5,710	43,900 6/	6,070 6/	45,500 6/	6,000 6/	50,400 6/
Combined value of other industrial minerals		XX	9,810	XX	9,470	XX	9,420
Total		XX	81,800	XX	92,500	XX	103,000

See footnotes at end of table.

TABLE 5--Continued
NONFUEL RAW MINERAL PRODUCTION 1/ IN THE UNITED STATES, BY STATE 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994 Quantity	1994 Value	1995 Quantity	1995 Value	1996 p/ Quantity	1996 p/ Value
Delaware:						
Gemstones	NA	1	NA	1	NA	1
Sand and gravel (construction)	2,580	8,680	2,680	8,740	3,100	10,700
Total 8/	XX	8,680	XX	8,750	XX	10,700
Florida:						
Cement:						
Masonry	400	34,600	383	35,200	418	38,300
Portland	3,370	228,000	3,170	233,000	3,210	236,000
Clays 3/	430	55,000	421	54,300	433	55,900
Gemstones	NA	W	NA	W	NA	1
Peat	206	3,230	294 10/	5,390 10/	288 10/	6,200 10/
Sand and gravel:						
Construction	16,600	60,700	19,300	69,300	20,500	76,700
Industrial	540	6,120	547	6,340	535	6,590
Stone (crushed)	66,300 6/	343,000	68,000	350,000	70,000	368,000
Combined value of clays (common), magnesium compounds, phosphate rock, rare-earth metal concentrates (1994), staurolite, titanium concentrates (ilmenite and rutile), zircon concentrates, and values indicated by symbol W	XX	669,000	XX	783,000	XX	749,000
Total	XX	1,400,000	XX	1,540,000	XX	1,540,000
Georgia:						
Clays	9,960 3/	1,060,000 3/	10,600	1,160,000	10,500	1,140,000
Gemstones	NA	51	NA	51	NA	W
Sand and gravel:						
Construction	5,520	19,800	5,780	23,100	6,460	27,100
Industrial	440	7,040	574	7,060	574	7,060
Stone:						
Crushed	54,600	331,000	60,600	373,000	63,800	399,000
Dimension metric tons	200,000 6/	19,100 6/	132,000	27,700	153,000	27,200
Combined value of barite, bauxite (1994-95), cement, clays [fire (1994)], feldspar, iron oxide pigments (crude), mica (scrap), and stone [dimension marble and miscellaneous (1994)], and value indicated by symbol W	XX	115,000	XX	109,000	XX	118,000
Total	XX	1,550,000	XX	1,700,000	XX	1,720,000
Hawaii:						
Cement:						
Masonry	6	395	5	501	5	455
Portland	404	28,300	357	35,500	305	30,300
Sand and gravel (construction)	521	4,740	405	4,030	425	4,340
Stone (crushed)	8,170	82,300	7,450 6/	73,500 6/	7,800 6/	77,200 6/
Total 8/	XX	116,000	XX	114,000	XX	112,000
Idaho:						
Clays	--	--	1	10	1	10
Gemstones	NA	287	NA	346	NA	365
Gold 4/ kilograms	W	W	8,850	110,000	9,300	117,000
Sand and gravel:						
Construction	14,500	46,300	13,200	43,500	11,600	37,700
Industrial	W	W	501	8,720	641	8,720
Silver 4/ metric tons	W	W	182	30,200	194	33,100
Stone (crushed)	4,160	20,300	3,210 6/	14,000 6/	2,800 6/	12,600 6/
Combined value of antimony, cement, copper, feldspar, garnet (industrial), lead, lime, molybdenum, phosphate rock, pumice and pumicite, stone [crushed miscellaneous (1995-96), dimension marble and miscellaneous (1994), dimension quartzite (1995-96)], vanadium ore, zinc, and values indicated by symbol W	XX	273,000	XX	303,000	XX	202,000
Total	XX	340,000	XX	510,000	XX	411,000

See footnotes at end of table.

TABLE 5--Continued
NONFUEL RAW MINERAL PRODUCTION 1/ IN THE UNITED STATES, BY STATE 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Illinois:						
Cement (portland)	2,590	151,000	2,560	169,000	2,540	168,000
Clays	494 6/	1,170 6/	504	1,220 3/	792	627 3/
Gemstones	NA	376	NA	269	NA	W
Sand and gravel:						
Construction	37,900	150,000	36,100	147,000	35,400	142,000
Industrial	4,420	65,700	4,410	67,500	4,360	62,600
Stone (crushed)	62,600 6/	353,000 6/	61,400	335,000	65,000	364,000
Combined value of barite, cement [masonry (1994)], clays (fuller's earth), copper (1994-95), fluorspar, lead (1994-95), lime, peat, silver (1994-95), stone [crushed miscellaneous (1994), dimension dolomite (1994)], tripoli, zinc, and value indicated by symbol W	XX	102,000	XX	107,000	XX	79,700 r/
Total	XX	823,000	XX	828,000	XX	817,000 r/
Indiana:						
Cement (portland)	2,290	132,000	2,330	143,000	2,280	140,000
Clays	774 3/	2,540 3/	915	3,350 3/	837	3,520
Gemstones	NA	29	NA	36	NA	W
Peat	23	W	17 10/	281 10/	W	W
Sand and gravel (construction)	28,100	108,000	24,900	93,900	26,700	107,000
Stone:						
Crushed	45,900	211,000	49,200	234,000 6/	53,500	260,000 6/
Dimension metric tons	173,000	25,800	172,000	31,400	190,000	29,500
Combined value of cement (masonry), clays [ball (1994-95)], gypsum (crude), lime, sand and gravel (industrial), stone [crushed slate (1995-96)], and values indicated by symbol W	XX	75,400	XX	82,700	XX	77,400
Total	XX	555,000	XX	589,000	XX	617,000
Iowa:						
Cement (portland)	2,390	153,000	2,340	161,000	2,690	185,000
Clays	384	1,520	322	1,590	301	1,450
Gemstones	NA	50	NA	57	NA	W
Gypsum (crude)	2,210	12,700	2,240	13,800	2,380	14,000
Peat	5	W	5 10/	77 10/	W	W
Sand and gravel (construction)	15,300	58,200	14,300	57,000	15,900	66,800
Stone (crushed)	36,600 6/	211,000	35,300	210,000	34,400	206,000
Combined value of cement (masonry), lime, sand and gravel (industrial), stone [crushed dolomite and miscellaneous (1994), dimension (1994), dimension dolomite and limestone (1996), dolomite and sandstone (1995)], and values indicated by symbol W	XX	14,800	XX	12,500	XX	12,500
Total	XX	451,000	XX	456,000	XX	486,000
Kansas:						
Cement:						
Masonry	24	2,090	31	2,650	32	2,710
Portland	1,640	101,000	1,730	109,000	2,050	129,000
Clays	556 3/	2,150 3/	620	2,390 3/	656	2,490 3/
Gemstones	NA	W	NA	W	NA	1
Helium:						
Crude million cubic meters	32	31,400	30	26,600	30	27,200
Grade-A do.	53	105,000	53	105,000	54	108,000
Salt	2,660	108,000	2,770	113,000	2,710	93,000
Sand and gravel (construction)	11,200	29,600	11,100	29,400	13,500	38,500
Stone:						
Crushed	21,500	103,000	20,400	95,800	22,200	106,000
Dimension 6/ metric tons	23,700	1,730	19,800	1,810	20,400	2,140

See footnotes at end of table.

TABLE 5--Continued
NONFUEL RAW MINERAL PRODUCTION 1/ IN THE UNITED STATES, BY STATE 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Kansas—Continued:						
Combined value of clays (fuller's earth), gypsum (crude), pumice and pumicite, sand and gravel (industrial), stone (dimension sandstone), and values indicated by symbol W	XX	11,900	XX	12,200	XX	15,200
Total	XX	497,000	XX	498,000	XX	524,000
Kentucky:						
Clays	820 3/	3,460 3/	904	3,430 3/	897	4,000 3/
Sand and gravel (construction)	9,140	32,200	8,710	31,700	7,000	24,500
Stone (crushed)	56,300	259,000	54,700 6/	230,000 6/	60,000 6/	261,000 6/
Combined value of cement, clays (ball), gemstones, lime, and stone [crushed (1995), crushed dolomite and sandstone (1996)]	XX	134,000	XX	161,000	XX	164,000
Total	XX	428,000	XX	426,000	XX	453,000
Louisiana:						
Clays	371	3,280	384	548	395	530
Gemstones	NA	155	NA	175	NA	W
Salt	13,500	140,000	14,700	177,000	15,000	189,000
Sand and gravel:						
Construction	12,300	49,600	11,300	50,200	11,600	51,600
Industrial	454	9,320	572	10,500	572	10,500
Stone (crushed) 6/	707	7,710	2,540	26,700	3,100	31,300
Combined value of gypsum (crude), lime, stone (crushed shell and miscellaneous), sulfur (Frasch), and value indicated by symbol W	XX	144,000	XX	169,000	XX	145,000
Total	XX	354,000	XX	434,000	XX	428,000
Maine:						
Gemstones	NA	235	NA	305	NA	W
Peat	W	W	15 10/	845 10/	W	W
Sand and gravel (construction)	5,890	24,400	6,420	26,900	7,170	31,200
Stone (crushed)	2,740	15,500	3,110	16,100	3,300	17,300
Combined value of cement, clays (common), stone [dimension (1994), dimension granite (1994-95)], and values indicated by symbol W	XX	20,900	XX	23,500	XX	24,600
Total	XX	61,000	XX	67,600	XX	73,100
Maryland:						
Cement (portland)	1,710	90,700	1,670	101,000	1,620	97,600
Clays	293	946	278	943	293	905
Gemstones	NA	1	NA	1	NA	1
Sand and gravel (construction)	8,920	61,200	9,700	61,700	9,750	62,400
Stone:						
Crushed	23,200 6/	157,000 6/	24,200	158,000	24,500	162,000
Dimension metric tons	18,800 6/	1,550 6/	20,700	2,260	11,100	1,190
Combined value of other industrial minerals	XX	29,000	XX	(7/)	XX	(7/)
Total	XX	340,000	XX	324,000	XX	324,000 8/
Massachusetts:						
Clays	W	W	31	W	31	W
Sand and gravel (construction)	12,300	60,000	11,700	67,500	13,500	81,000
Stone:						
Crushed	10,400 6/	96,800 6/	11,100	97,400	9,200	80,500
Dimension metric tons	57,300	9,600	77,600	14,600	121,000	18,800
Combined value of clays (common), gemstones, lime, peat, stone [crushed dolomite and limestone, (1994)], and values indicated by symbol W	XX	11,100	XX	10,700	XX	10,800
Total	XX	178,000	XX	190,000	XX	191,000
Michigan:						
Cement:						
Masonry	235	17,700	229	16,700	247	18,100
Portland	5,160	331,000	5,400	361,000	5,580	373,000

See footnotes at end of table.

TABLE 5--Continued
NONFUEL RAW MINERAL PRODUCTION 1/ IN THE UNITED STATES, BY STATE 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Michigan--Continued:						
Clays	1,150	3,370	623	3,430	647	3,390
Gemstones	NA	2	NA	2	NA	W
Gypsum (crude)	1,790	15,300	1,510	14,900	1,360	15,300
Iron ore (usable)	13,800	W	13,500	W	W	W
Lime	637	33,000	653	34,600	484	25,300
Peat	156	5,090	173 10/	5,510 10/	168 10/	4,500 10/
Sand and gravel:						
Construction	48,800	160,000	53,500	178,000	54,400	185,000
Industrial	2,870	31,300	2,940	30,600	2,820	27,500
Stone:						
Crushed	35,000	113,000	37,500	127,000	38,000	131,000
Dimension metric tons	147 6/	35 6/	W	W	W	W
Combined values of bromine, copper (1994-95), iron oxide pigments (crude), magnesium compounds, potash, salt, silver (1994-95), stone [dimension dolomite and sandstone (1995-96), dimension sandstone (1994)], and values indicated by symbol W	XX	761,000	XX	736,000	XX	725,000
Total	XX	1,470,000	XX	1,510,000	XX	1,510,000
Minnesota:						
Clays	W	W	48	W	11 3/	W
Gemstones	NA	26	NA	26	NA	W
Iron ore (usable)	43,300	1,160,000	47,000	1,310,000	47,000	1,590,000
Peat	37	3,010	24 10/	2,070 10/	27 10/	2,240 10/
Sand and gravel (construction)	29,500	90,000	31,900	99,400	32,600	104,000
Stone:						
Crushed	10,900	47,100	11,300 6/	47,400 6/	12,000 6/	52,200 6/
Dimension metric tons	16,900 6/	W	26,900	11,100	29,600	11,100
Combined value of clays (common, kaolin), lime, sand and gravel (industrial), stone [crushed quartzite and traprock (1995-96), dimension dolomite and granite (1994)], and values indicated by symbol W	XX	44,900	XX	40,400	XX	39,500
Total	XX	1,340,000	XX	1,510,000	XX	1,800,000
Mississippi:						
Clays	1,190 3/	40,500 3/	1,230	44,000	1,140	40,300
Gemstones	NA	1	NA	1	NA	1
Sand and gravel (construction)	12,400	53,200	11,800	53,000	13,300	63,200
Stone (crushed)	1,900	7,500	1,990 6/	8,010 6/	2,200 6/	9,400 6/
Combined value of other industrial minerals	XX	33,900	XX	25,500	XX	26,600
Total 8/	XX	135,000	XX	131,000	XX	140,000
Missouri:						
Cement (portland)	4,730	265,000	4,360	270,000	4,490	278,000
Clays	1,250 3/	7,910 3/	1,610	10,300 3/	1,530	3,760 3/
Copper 4/	8	18,900	7	22,800	9	22,000
Gemstones	NA	67	NA	58	NA	W
Lead 4/ metric tons	290,000	238,000	W	W	W	W
Sand and gravel:						
Construction	9,760	36,500	8,840	32,400	10,500	41,000
Industrial	559	9,970	W	W	W	W
Silver 4/ metric tons	40	6,860	W	W	W	W
Stone (crushed)	68,900	330,000	65,700 6/	305,000 6/	65,500 6/	311,000 6/
Zinc 4/ metric tons	42,000	45,600	W	W	W	W
Combined value of barite, cement (masonry), clays (fuller's earth), iron ore (usable), iron oxide pigments (crude), lime, stone [crushed granite (1995-96), dimension granite], and values indicated by symbol W	XX	128,000	XX	495,000	XX	596,000
Total	XX	1,090,000	XX	1,140,000	XX	1,250,000

See footnotes at end of table.

TABLE 5--Continued

NONFUEL RAW MINERAL PRODUCTION 1/ IN THE UNITED STATES, BY STATE 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1994		1995		1996 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
Montana:							
Clays		28 3/	W	33 3/	90 3/	33 3/	90 3/
Gemstones		NA	3,400	NA	938	NA	1,030
Gold 4/	kilograms	12,600	156,000	12,400	155,000	12,500	157,000
Iron ore (usable)		--	--	5	60	W	W
Lead 4/	metric tons	9,940	8,140	W	W	W	W
Palladium	kilograms	6,440	29,400	5,260	22,000	5,000	21,700
Platinum	do.	1,960	25,300	1,590	20,800	1,600	21,100
Sand and gravel (construction)		7,360	28,800	8,870	34,900	7,680	26,900
Silver 4/	metric tons	71	12,000	76	12,600	94	16,000
Stone (crushed)		2,320	8,830	2,370 6/	9,920 6/	2,400 6/	10,200 6/
Zinc 4/	metric tons	21,000	22,800	22,700	27,900	W	W
Combined value of barite (1994), cement, clays [bentonite, common (1994), fire], copper, lime, molybdenum, peat, sand and gravel [industrial (1994-95), stone [crushed quartzite (1995-96), dimension (1994), dimension miscellaneous (1995-96)], talc and pyrophyllite, and values indicated by symbol W		XX	249,000	XX	291,000	XX	269,000
Total		XX	543,000	XX	575,000	XX	523,000
Nebraska:							
Clays		206	867	232	1,130	235	1,140
Lime		24	904	20	803	18	737
Sand and gravel (construction)		15,000	49,200	13,700	47,100	13,900	48,000
Stone (crushed)		6,890	41,600	6,590	41,800	6,400	40,900
Combined value of cement, gemstones, and sand and gravel (industrial)		XX	53,600	XX	55,500	XX	56,200
Total		XX	146,000	XX	146,000	XX	147,000
Nevada:							
Barite		284 11/	5,020 11/	W	W	W	W
Clays 3/		7	2,860	6	477	29	3,670
Copper 4/		6	15,800	6	19,800	W	W
Gemstones		NA	160	NA	306	NA	345
Gold 4/	kilograms	214,000	2,700,000	213,000	2,650,000	214,000	2,690,000
Sand and gravel:							
Construction		22,700	106,000	22,500	110,000	21,400	103,000
Industrial		572	W	W	W	W	W
Silver 4/	metric tons	673	115,000	766	127,000	791	135,000
Stone (crushed)		2,310	20,600	2,410	21,400	2,500	22,400
Combined value of barite, brucite, cement (portland), clays (fuller's earth, kaolin), diatomite, gypsum (crude), lime, lithium minerals, magnesite, mercury, perlite (crude), salt, and values indicated by symbol W		XX	149,000	XX	180,000	XX	282,000
Total		XX	3,110,000	XX	3,110,000	XX	3,230,000
New Hampshire:							
Clays		3	16	3	16	3	16
Gemstones		NA	21	NA	9	NA	W
Sand and gravel (construction)		7,120	32,600	7,190	34,300	6,300	29,600
Stone:							
Crushed 6/		1,390	7,470	2,150	9,150	2,000	8,700
Dimension	metric tons	35,300	6,300	23,000	6,290	30,000	5,530
Total 8/		XX	46,400	XX	49,800	XX	43,900
New Jersey:							
Clays		W	W	82	135	82	135
Gemstones		NA	1	NA	1	NA	1
Sand and gravel:							
Construction		16,100	100,000	14,000	80,300	12,000	67,200
Industrial		1,690	30,600	1,760	31,000	1,810	31,900
Stone (crushed)		19,800	154,000	21,000	132,000	19,300	123,000

See footnotes at end of table.

TABLE 5--Continued
NONFUEL RAW MINERAL PRODUCTION 1/ IN THE UNITED STATES, BY STATE 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1994		1995		1996 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
New Jersey--Continued:							
Combined value of other industrial minerals		XX	4,460	XX	(7/)	XX	(7/)
Total		XX	289,000	XX	243,000 8/	XX	222,000 8/
New Mexico:							
Clays 3/		127	269	127	274	127	274
Copper 4/		234	574,000	250	764,000	W	W
Gemstones		NA	14	NA	22	NA	W
Potash (K2O)		2,450	219,000	2,330	209,000	2,330	200,000
Pumice and pumicite	metric tons	129,000	1,050	W	W	W	W
Sand and gravel (construction)		10,400	47,400	10,400	50,700	10,900	54,500
Silver 4/	metric tons	22	3,750	20	3,300	27	4,600
Stone (crushed)		3,550 6/	20,000 6/	3,660	18,800	3,600	18,700
Combined value of cement [masonry (1994), portland], gypsum, clays (fire), gold, gypsum (crude), iron ore (usable), mica (crude), molybdenum, perlite (crude), salt, stone [crushed quartzite and traprock (1994), dimension granite and marble (1995-96), dimension granite, marble, and miscellaneous (1994)], and values indicated by symbol W		XX	65,100	XX	83,900	XX	685,000
Total		XX	930,000	XX	1,130,000	XX	963,000
New York:							
Cement:							
Masonry		82	6,020	90	7,210	81	6,440
Portland		2,650	139,000	2,530	205,000	2,500	202,000
Clays		507	9,270	563	12,500	563	12,500
Gemstones		NA	W	NA	W	NA	138
Peat		W	12	W	W	W	W
Salt		6,060	233,000	4,480	185,000	3,370	163,000
Sand and gravel (construction)		28,000	138,000	27,300	134,000	28,600	143,000
Stone:							
Crushed		39,400	239,000	39,500	204,000	42,000	223,000
Dimension	metric tons	24,600 6/	7,370 6/	32,800	8,440	36,200	7,640
Combined value of garnet (industrial), gypsum (crude), lead, sand and gravel (industrial), silver, stone [dimension granite and quartzite (1994)], talc and pyrophyllite, wollastonite, zinc, and values indicated by symbol W		XX	117,000	XX	130,000	XX	134,000
Total		XX	889,000	XX	886,000	XX	891,000
North Carolina:							
Clays 3/		2,530	12,500	2,430	12,500	2,400	11,100
Feldspar	metric tons	488,000	17,600	497,000	18,400	509,000	18,900
Gemstones		NA	565	NA	4,440	NA	680
Mica (scrap)		68	3,270	74	3,690	W	W
Peat		21	W	19 10/	340 10/	W	W
Sand and gravel:							
Construction		11,100	50,700	10,100	50,100	11,300	58,400
Industrial		1,460	24,200	1,330	21,900	1,640	26,900
Stone:							
Crushed		53,900 6/	351,000 6/	57,300	384,000	57,000	388,000
Dimension	metric tons	33,700 6/	12,500 6/	41,100 6/	15,400 6/	48,500	16,000
Combined value of clays (kaolin), lithium minerals, olivine, phosphate rock, stone [dimension quartzite, sandstone, slate and miscellaneous (1994-95)], talc and pyrophyllite, and values indicated by symbol W		XX	231,000 r/	XX	225,000	XX	211,000
Total		XX	703,000	XX	735,000	XX	731,000
North Dakota:							
Clays		59	W	59	W	59	W
Lime		W	6,590	W	W	W	W
Sand and gravel (construction)		6,810	18,500	8,420	23,900	8,500	24,500

See footnotes at end of table.

TABLE 5--Continued
NONFUEL RAW MINERAL PRODUCTION 1/ IN THE UNITED STATES, BY STATE 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994 Quantity	1994 Value	1995 Quantity	1995 Value	1996 p/ Quantity	1996 p/ Value
North Dakota--Continued:						
Combined value of clays (common), gemstones, peat, sand and gravel (industrial), and values indicated by symbol W	XX	199	XX	7,300	XX	5,840
Total	XX	25,300	XX	31,200	XX	30,300
Ohio:						
Cement (portland)	1,050	69,700	1,050	72,700	1,030	71,300
Clays	2,080 3/	12,500 3/	1,930	10,700	2,110	9,090
Gemstones	NA	43	NA	3	NA	3
Lime	1,850	113,000	1,920	117,000	2,030	124,000
Sand and gravel:						
Construction	47,700	205,000	45,300	196,000	45,900	201,000
Industrial	1,260	27,700	1,270	28,800	1,480	31,600
Stone:						
Crushed	56,400	251,000	60,900	265,000	62,600	279,000
Dimension metric tons	W	W	17,900	1,670	18,800	1,610
Combined value of cement (masonry), clays [ball (1994)], gypsum (crude), peat, salt, stone [dimension limestone and sandstone (1994)], and value indicated by symbol W	XX	201,000	XX	200,000	XX	217,000
Total	XX	880,000	XX	891,000	XX	934,000
Oklahoma:						
Cement:						
Masonry	91	7,410	95	7,250	100	7,630
Portland	1,680	102,000	1,740	110,000	1,820	115,000
Clays	771	3,910	674	3,580	814	6,710
Gypsum (crude)	2,890	17,000	2,830	17,000	2,890	17,900
Iodine (crude) metric tons	1,630	12,800	1,210	12,500	1,170	15,800
Sand and gravel:						
Construction	8,480	27,200	7,800	25,100	8,330	27,500
Industrial	1,230	24,000	1,250	25,400	1,250	25,400
Stone:						
Crushed	29,900	125,000	31,100	125,000	29,600	126,000
Dimension metric tons	3,980 6/	1,250 6/	9,170 6/	2,350 6/	14,000	2,220
Combined value of feldspar, gemstones, helium [crude (1995-96)], lime, salt, stone [crushed shell and traprock (1995-96), dimension quartzite and sandstone (1995), dimension sandstone (1994)], and tripoli	XX	19,400	XX	28,700	XX	28,700
Total	XX	340,000	XX	357,000	XX	372,000
Oregon:						
Clays	240	1,560	240	1,270	174	1,980
Copper 4/	(12/)	260	--	--	--	--
Gemstones	NA	2,160	NA	4,570	NA	3,860
Nickel ore metric tons	--	--	1,560	W	-- 13/	-- 13/
Pumice and pumicite do.	220,000	2,760	W	W	W	W
Sand and gravel (construction)	18,400	83,600	18,200	85,000	19,100	90,700
Silver 4/ metric tons	(12/)	10	--	--	--	--
Stone (crushed)	18,900	90,100	20,700	95,700	21,600	102,000
Zinc 4/ metric tons	118	128	--	--	--	--
Combine value of cement (portland), diatomite, emery, gold (1994), lime, talc and pyrophyllite, and values indicated by symbol W	XX	62,100	XX	52,500	XX	52,800
Total	XX	243,000	XX	239,000	XX	251,000
Pennsylvania:						
Cement:						
Masonry	245	19,300	267	21,200	255	20,000
Portland	5,630	315,000	5,610	355,000	5,070	320,000
Clays	811	4,040	750	3,250	679	2,970
Gemstones	NA	1	NA	1	NA	1

See footnotes at end of table.

TABLE 5--Continued
NONFUEL RAW MINERAL PRODUCTION 1/ IN THE UNITED STATES, BY STATE 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Pennsylvania--Continued:						
Lime	1,590	95,500	1,640	107,000	1,510	98,700
Peat metric tons	10	296	11 10/	294 10/	5 10/	164 10/
Sand and gravel (construction)	15,900	89,700	17,100	93,100	14,900	78,200
Stone:						
Crushed	76,700	462,000	80,900	492,000	81,700	507,000
Dimension metric tons	43,700 6/	7,280 6/	57,600	12,300	61,600	12,300
Combined value of other industrial minerals	XX	13,300	XX	(7/)	XX	(7/)
Total	XX	1,010,000	XX	1,080,000 8/	XX	1,040,000 8/
Rhode Island:						
Gemstones	NA	1	NA	1	NA	1
Sand and gravel (construction)	2,310	14,200	2,790	21,500	3,000	23,900
Stone (crushed)	1,610	12,200	1,250	9,140	1,100	8,000
Total 8/	XX	26,300	XX	30,700	XX	31,900
South Carolina:						
Cement (portland)	2,210	143,000	2,210	156,000	2,440	172,000
Clays	1,520 3/	30,400 3/	1,620	21,700 3/	1,690	21,700
Sand and gravel:						
Construction	8,600	26,100	8,880	29,000	9,590	33,100
Industrial	699	18,100	839	20,500	839	20,500
Stone (crushed)	20,500 6/	131,000 6/	22,000	132,000	23,800	146,000
Combined value of cement (masonry), clays [fire (1995), kaolin (1994)], gemstones, gold, manganiferous ore, mica (scrap), peat, silver, stone [crushed marble (1994), dimension granite], and vermiculite	XX	93,900	XX	88,700	XX	102,000
Total	XX	442,000	XX	447,000	XX	495,000
South Dakota:						
Clay (common)	W	W	136	W	106	W
Gemstones	NA	110	NA	173	NA	W
Gold 4/ kilograms	W	W	17,100	214,000	W	W
Sand and gravel (construction)	7,700	23,700	8,730	26,200	9,540	31,000
Silver 4/ metric tons	4	696	4	668	7	1,190
Stone (crushed) 6/	5,490	24,500	5,420	25,700	5,800	28,000
Combined value of cement, clays (common), feldspar, iron ore (usable), lime, mica (scrap), stone [crushed granite and miscellaneous (1995-96), crushed miscellaneous (1994), dimension granite], and values indicated by symbol W	XX	274,000	XX	65,300	XX	293,000
Total	XX	323,000	XX	332,000	XX	353,000
Tennessee:						
Clays 3/	665	28,600	664	29,000	687	31,400
Gemstones	NA	23,100	NA	35,400	NA	W
Sand and gravel:						
Construction	8,710	38,000	8,020	36,700	8,530	40,100
Industrial	660	11,600	918	14,700	818	13,400
Stone (crushed)	49,200	265,000	52,600	286,000	53,000	292,000
Combined value of barite, cement, clays [bentonite (1994), common, fuller's earth, kaolin (1995)], copper (1994-95), lead (1994-95), lime, silver (1994-95), stone (dimension), zinc, and value indicated by symbol W	XX	235,000	XX	282,000	XX	275,000
Total	XX	602,000	XX	683,000	XX	651,000
Texas:						
Cement:						
Masonry	258	18,200	202	17,600	228	19,900
Portland	8,620	456,000	8,090	499,000	8,370	516,000
Clays 3/	2,190	13,700	2,450	26,000	2,490	18,000
Gemstones	NA	448	NA	353	NA	W

See footnotes at end of table.

TABLE 5--Continued
NONFUEL RAW MINERAL PRODUCTION 1/ IN THE UNITED STATES, BY STATE 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994 Quantity	1994 Value	1995 Quantity	1995 Value	1996 p/ Quantity	1996 p/ Value
Texas--Continued:						
Gypsum (crude)	1,870	10,100	1,880	16,200	1,870	16,600
Helium (crude) million cubic meters	7	7,050	5	4,730	W	W
Lime	1,210	76,200	1,370	85,800	1,410	88,100
Salt	8,760	76,500	9,110	85,000	8,970	76,100
Sand and gravel:						
Construction	56,700	242,000	61,100	271,000	72,000	342,000
Industrial	1,570	37,900	1,600	40,300	1,570	39,300
Stone:						
Crushed	76,100	300,000	81,100	310,000	86,000	335,000
Dimension metric tons	W	W	54,000	13,300	51,800	12,600
Talc and pyrophyllite do.	225,000	5,860	294,000	5,840	236,000	4,580
Combined value of clays [ball (1994), bentonite, fuller's earth, kaolin (1994)], helium [crude (1996), Grade-A], iron ore [usable (1994)], magnesium compounds, magnesium metal, sodium sulfate (natural), stone [dimension granite and limestone (1994)], sulfur (Frasch), and values indicated by symbol W	XX	295,000	XX	301,000	XX	314,000
Total	XX	1,540,000	XX	1,680,000	XX	1,780,000
Utah:						
Beryllium concentrates metric tons	4,330	5	5,040	6	5,430	6
Clays	243 3/	3,410 3/	424	4,280 3/	477	4,440 3/
Gemstones	NA	620	NA	939	NA	W
Iron ore (usable)	W	W	144	1,700	W	W
Salt	1,680	56,700	2,160	54,800	2,030	30,100
Sand and gravel (construction)	21,100	69,600	23,800	80,200	27,000	97,200
Stone (crushed)	4,540	19,800	4,140	14,800	3,800	13,900
Combined value of cement, clays (bentonite), copper, gold, gypsum (crude), helium (Grade-A), lime, magnesium compounds, magnesium metal, mercury, molybdenum, phosphate rock, potash, silver, stone [dimension (1995), dimension quartzite and sandstone (1994, 1996)], and values indicated by symbol W	XX	1,370,000	XX	1,700,000	XX	1,410,000
Total	XX	1,520,000	XX	1,850,000	XX	1,560,000
Vermont:						
Asbestos metric tons	1,130	920	--	--	--	--
Gemstones	NA	1	NA	1	NA	1
Sand and gravel (construction)	3,890	14,500	3,220	11,000	4,200	15,800
Stone:						
Crushed	4,170	23,700	4,420	20,700	4,200	20,000
Dimension metric tons	78,900	23,200	100,000	28,700	107,000	31,000
Total 8/	XX	62,300	XX	60,400	XX	66,800
Virginia:						
Cement (portland)	930	54,700	W	W	W	W
Clays	870 3/	3,250 3/	891	3,200 3/	912	2,890 3/
Gemstones	NA	W	NA	W	NA	11
Lime	742	40,200	731	41,900	748	42,800
Sand and gravel (construction)	8,060	33,400	9,710	42,300	10,100	44,900
Stone:						
Crushed	56,700	327,000	55,400	326,000	57,000	339,000
Dimension metric tons	108 6/	13 6/	W	W	W	W

See footnotes at end of table.

TABLE 5--Continued
NONFUEL RAW MINERAL PRODUCTION 1/ IN THE UNITED STATES, BY STATE 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Virginia--Continued:						
Combine value of cement, clays (fuller's earth), feldspar, gypsum (crude), iron oxide pigments (crude), kyanite, sand and gravel (industrial), stone [dimension dolomite, slate and traprock (1995-96), dimension granite and slate (1994)], talc and pyrophyllite (1994, 1996), vermiculite, and values indicated by symbol W	XX	43,600	XX	101,000	XX	98,900
Total	XX	502,000	XX	515,000	XX	529,000
Washington:						
Clays	246 3/	1,140 3/	220	1,040	234	1,160
Gemstones	NA	1,050	NA	53	NA	W
Gold 4/ kilograms	7,410	91,800	W	W	W	W
Lime	239	W	W	W	W	W
Peat metric tons	3	111	2 10/	87 10/	W	W
Sand and gravel (construction)	39,600	165,000	37,700	155,000	41,500	183,000
Stone (crushed)	14,700	91,900	15,800 6/	76,800 6/	15,200 6/	85,900 6/
Combined value of cement, clays [fire (1994)], diatomite, magnesium metal, olivine, sand and gravel (industrial), silver (1994), stone [crushed dolomite, limestone and marble (1995-96), dimension miscellaneous], and values indicated by symbol W	XX	225,000	XX	350,000	XX	356,000
Total	XX	576,000	XX	582,000	XX	626,000
West Virginia:						
Clays	138	291	184	365	167	306
Gemstones	NA	1	NA	1	NA	1
Sand and gravel (construction)	1,380	5,970	1,800	7,650	1,550	6,360
Stone (crushed)	12,300 6/	99,300	11,800 6/	75,000 6/	13,000 6/	81,900 6/
Combined value of cement, lime, peat, salt, sand and gravel (industrial), and stone [crushed dolomite, dimension sandstone]	XX	75,500	XX	97,700	XX	102,000
Total	XX	181,000	XX	181,000	XX	191,000
Wisconsin:						
Gemstones	NA	53	NA	65	NA	W
Lime	507	30,300	568	33,900	552	33,000
Peat	2	61	W	W	W	W
Sand and gravel:						
Construction	29,200	91,500	32,200	102,000	32,900	105,000
Industrial	1,630	32,400	1,670	33,300	1,670	33,300
Silica stone 9/ metric tons	45	80	W	W	W	W
Stone:						
Crushed	28,600	115,000 6/	26,000	108,000	25,000	106,000
Dimension metric tons	125,000	14,100	128,000	14,500	143,000	14,400
Combined value of copper, gold, silver, stone [crushed quartzite (1994)], and values indicated by symbol W	XX	126,000	XX	124,000	XX	107,000
Total	XX	409,000	XX	416,000	XX	399,000
Wyoming:						
Clays	2,530 3/	91,300 3/	2,970	89,900 3/	3,210	95,700 3/
Gemstones	NA	13	NA	11	NA	W
Sand and gravel (construction)	3,210	13,100	3,860	17,500	3,100	13,200
Stone (crushed)	5,040	29,700	4,670	27,500	4,500	26,800
Combined value of cement (portland), clays (common), gypsum (crude), helium (Grade-A), lime, soda ash, and value indicated by symbol W	XX	746,000	XX	838,000	XX	783,000
Total	XX	880,000	XX	973,000	XX	918,000

See footnotes at end of table.

TABLE 5--Continued
NONFUEL RAW MINERAL PRODUCTION 1/ IN THE UNITED STATES, BY STATE 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Undistributed:						
Alaska (1995-96), Delaware, Hawaii, Maryland (1995-96), New Hampshire, New Jersey (1995-96), Pennsylvania (1995-96), Rhode Island, Vermont, and Undistributed (1996).	XX	14,700	XX	121,000	XX	145,000

p/ Preliminary. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data, value included with "Combined value." XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value."

4/ Recoverable content of ores, etc.

5/ Data collected by state.

6/ Excludes certain stones; kind and value included with "Combined value."

7/ Value excluded to avoid disclosing company proprietary data.

8/ Partial total, excludes values which must be concealed to avoid disclosing company proprietary data. Withheld values included with "Undistributed."

9/ Grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

10/ Data series changed to production beginning in 1995, prior years data may not be comparable.

11/ Excludes certain barites; kind and value included with "Combined value."

12/ Less than 1/2 unit.

13/ The mine on Nickel Mountain was on care and maintenance basis in 1996.

TABLE 6
NONFUEL RAW MINERAL PRODUCTION IN THE COMMONWEALTH OF PUERTO RICO AND ISLANDS ADMINISTERED BY THE UNITED STATES 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Puerto Rico:						
Cement (portland)	W	W	1,410	W	1,520	W
Clays	119	338	W	W	W	W
Lime	23	2,970	23	2,970	16	2,090
Stone (crushed)	10,500	78,400	15,300	107,000	15,300	107,000
Total 3/	XX	81,700	XX	110,000	XX	109,000
Administered Islands:						
American Samoa: Stone (crushed)	84	W	W	W	W	W
Guam: Stone (crushed)	2,150	12,700	2,060	17,400	2,100	17,400
Total 3/	XX	12,700	XX	17,400	XX	17,400

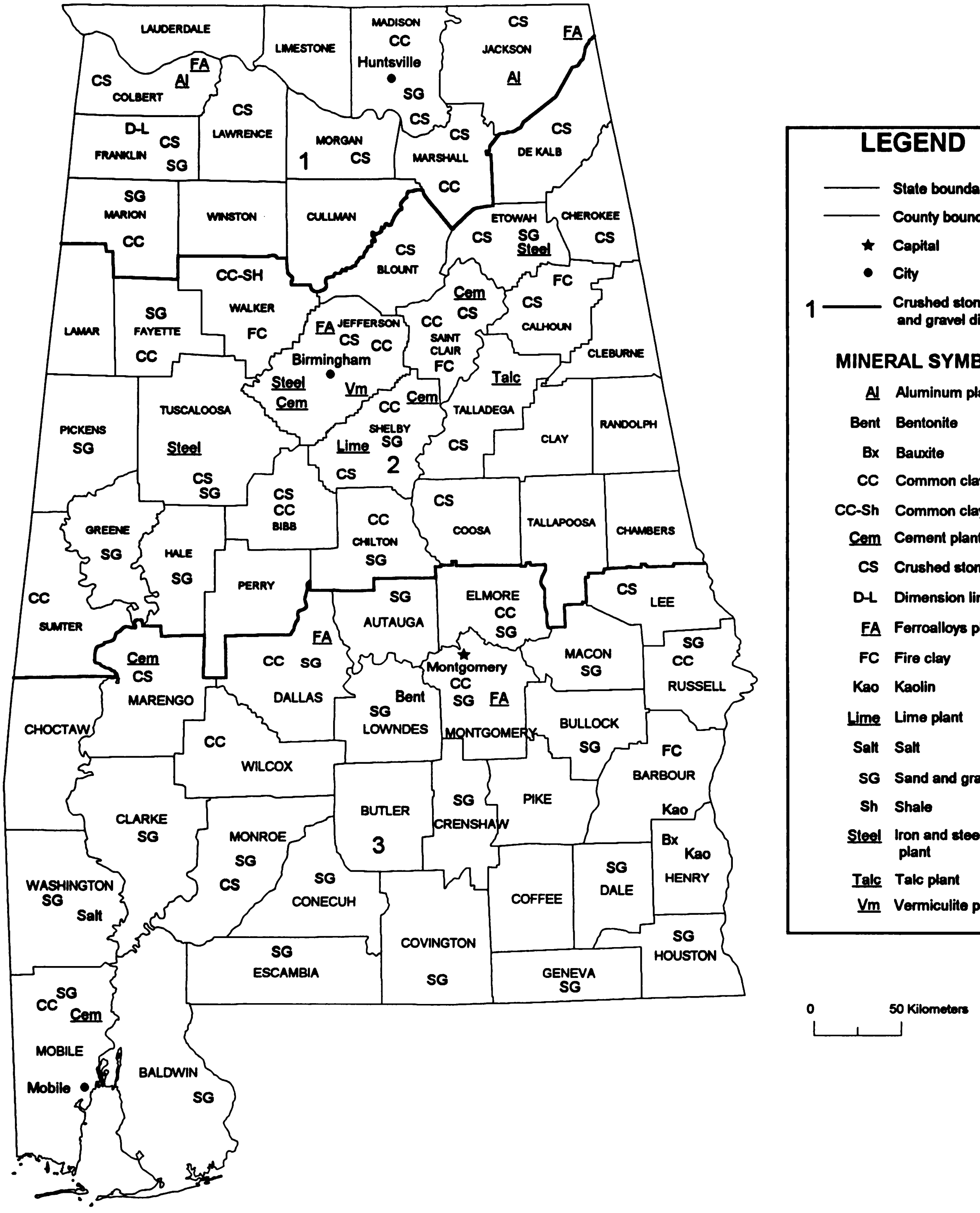
p/ Preliminary. W Withheld to avoid disclosing company proprietary data; not included in "Total." XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Total does not include values of items withheld.

ALABAMA



LEGEND

───	State boundary
───	County boundary
★	Capital
●	City
1 ───	Crushed stone/sand and gravel districts

MINERAL SYMBOLS

Al	Aluminum plant
Bent	Bentonite
Bx	Bauxite
CC	Common clay
CC-Sh	Common clay and shale
Cem	Cement plant
CS	Crushed stone
D-L	Dimension limestone
FA	Ferroalloys plant
FC	Fire clay
Kao	Kaolin
Lime	Lime plant
Salt	Salt
SG	Sand and gravel
Sh	Shale
Steel	Iron and steel plant
Talc	Talc plant
Vm	Vermiculite plant

Source: Geological Survey of Alabama/U.S. Geological Survey

THE MINERAL INDUSTRY OF ALABAMA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Geological Survey of Alabama for collecting information on all nonfuel minerals.

In 1996, Alabama rose from 18th to 17th among the 50 States in nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $735 million, about a 4% increase from that of 1995. This followed a nearly 12% increase from 1994 to 1995 (based on final 1995 data). The State accounted for nearly 2% of the U.S. total nonfuel mineral production value.

The top four nonfuel mineral commodities produced in Alabama in 1996 were, in descending order of value, portland cement, crushed stone, lime, and construction sand and gravel; these accounted for close to 87% of the State's total nonfuel mineral value. The combined value of crushed stone and portland cement represented almost 65% of the total. Crushed stone and construction sand and gravel production provided the highest dollar increases in nonfuel mineral value for the State (*see table 1*), increasing by 7% and 13% of their previous years values, respectively. Clays were also an important portion of the State's nonfuel mineral economy, but changes in their values during the year were small relative to those of the other mineral commodities. The State's clays included bentonite, common clays, fire clays, and kaolin. All nonfuel minerals increased in value, except for bauxite, bentonite, industrial sand and gravel, and salt, all of which had only small decreases.

Increases in nonfuel mineral commodity values were even greater in 1995. The value of portland cement, being the highest dollar increase, increased by 15%, lime by nearly 19%, and crushed stone by 6%. The increase in portland cement value reflected a nationwide trend of higher cement prices. Decreases in value were small and occurred for dimension stone, industrial sand and gravel, salt, and gemstones.

Nonfuel mineral production in Alabama consisted entirely of industrial minerals; no metals were mined in the State. Compared with USGS estimates of the quantities produced in the other 49 States in 1996, Alabama became the only bauxite-producing State and remained fourth in masonry cement and bentonite, and sixth in portland cement. While Alabama rose from third to first in common clays and third to second in kaolin and fire clays, the State dropped from third to fourth in lime and seventh to eighth in salt. Additionally, Alabama's stone quarries and sand pits produced substantial quantities of crushed stone and construction and industrial sand and gravel. All metal production in the State, especially that of raw steel, was the result of processing materials acquired from other domestic and foreign sources. Based on American Iron and Steel Institute data, Alabama was an estimated sixth in the Nation in the manufacture of raw steel. Bauxite that is mined in the State is a natural mixture of bauxitic clay and bauxite that has a very low iron oxide content and is primarily used to make refractory (high temperature resistant) products, rather than to produce primary aluminum.

The following narrative information was provided by the Geological Survey of Alabama[2] (GSA). The GSA reported that 179 companies or operations were involved in the mining and production of mineral resources in the State during 1996. Record production of limestone, dolomite, and marble was recorded. Clay, sandstone, and shale also increased over the previous period. Demand for industrial minerals was expected to continue to increase, especially for those produced near urban areas where the need is greatest for construction materials. According to the GSA, chert, shale, and recovered sulfur were produced in Alabama, in addition to the minerals included in tables 1 through 6.

Mineral exploration in Alabama continued to focus on industrial mineral resources. The total capital investment in expanding operations in the State exceeded $80 million in 1995-96, a 50% increase over 1993-94. To follow are several of the major projects. In Shelby County, three companies announced a total capital investment of $35.5

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (e.g., construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing also may be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Lewis S. Dean, Geologist, authored the text of State minerals information provided by the Geological Survey of Alabama.

million to enlarge high-calcium limestone quarries and associated lime production in order to meet increased market demands for quicklime and hydrated lime. The GSA reported Shelby County to be one of the top three lime-producing counties in the United States. ECC International Corp. completed a $10 million expansion of its calcium carbonate operation at its Sylacauga marble quarry in Talladega County. Whereas in previous years the marble that was quarried there was used primarily for monuments and for decorative purposes, today's operations predominantly produce crushed marble. Crushed marble was used in a number of diversified applications, including industrial fillers, fertilizer, and aggregate. Micronized marble was shipped as a slurry for use in paper pigment and coating.

Other expanding mineral industries included those of refractory and common clay production in northern Alabama and synthetic zeolite production in southern Alabama. Expansions also were reported in ferrosilicon production at plants in Selma and Mount Meigs. These plants utilize high-silica deposits of the Montgomery sand and gravel district.

In the steel industry, Tuscaloosa Steel Corp., Tuscaloosa, began operating a 1-million-ton-per-year melt shop, containing a 150-ton electric arc furnace and a single strand continuous slab caster. The company wanted to avoid buying slabs for processing in a volatile market. In 1997, the melt shop will be supplied with direct reduced iron feed from two units relocated from Scotland to Mobile, AL, by Tuscaloosa parent company British Steel Plc (Schriefer, 1996; Steel Times International, 1997). A new minimill was under construction near Decatur by Trico Steel Co., a joint venture of LTV Corp., Sumitomo Metal Industries Ltd., and British Steel Plc. The facility will have two oxy-fuel electric arc furnaces melting 2.2 million tons per year of raw steel, two ladle metallurgy stations, two continuous thin slab casters, and a hot strip mill (Business Week, 1995; Iron and Steel Maker, 1995; 33 Metal Producing, 1995).

The GSA published its annual minerals industry summary which provides details of the occurrence, mining history, and general economics of specific mineral resources in Alabama. More information on geology, hydrology, and environmental considerations related to these resources is available from the GSA.

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Steel Times International, 1997: Steel Times International, v. 13, no. 1, p. 38.
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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ALABAMA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	312	28,900	306	30,700	317	31,800
Portland	3,980	248,000	4,090	285,000	4,140	288,000
Clays	2,280 3/	25,400 3/	2,690	33,700	3,360	35,200
Gemstones	NA	W	NA	16,000	NA	W
Lime	1,660	88,300	1,730	105,000	1,760	107,000
Sand and gravel:						
Construction	12,500	47,600	11,900	49,400	13,000	55,900
Industrial	610	7,160	479	5,940	475,000	5,870
Stone (crushed)	32,500	164,000	33,600	174,000	35,500	186,000
Combined value of bauxite, clays [bentonite (1994)], iron oxide pigments [crude (1996)], salt, and stone [dimension limestone, marble and sandstone (1994), dimension limestone and sandstone (1995-96)], and values indicated by symbol W	XX	16,500	XX	6,810	XX	25,100
Total	XX	626,000	XX	706,000	XX	735,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value" data.

TABLE 2
ALABAMA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	563	$3,000	$5.32
Filter stone	28	109	3.89
Other coarse aggregate	W	W	4.44
Coarse aggregate, graded:			
Concrete aggregate, coarse	3,780	17,200	4.56
Bituminous aggregate, coarse	3,080	14,600	4.73
Bituminous surface-treatment aggregate	296	1,400	4.74
Railroad ballast	185	805	4.35
Other graded coarse aggregate	W	W	4.29
Fine aggregate (-3/8 inch):			
Screening, undesignated	511	2,240	4.38
Other fine aggregates	W	W	3.86
Coarse and fine aggregates:			
Graded road base or subbase	3,360	14,500	4.31
Terrazzo and exposed aggregate	54	1,260	23.40
Crusher run or fill or waste	2,740	13,700	5.00
Other coarse and fine aggregates	W	W	4.33
Other construction materials 3/	2,730	12,300	4.51
Agricultural:			
Agricultural limestone	261	1,940	7.42
Poultry grit and mineral food	64	700	10.90
Chemical and metallurgical:			
Cement manufacture	3,460	8,860	2.56
Lime manufacture	757	3,120	4.11
Dead-burned dolomite manufacture	363	1,540	4.24
Special: Other fillers or extenders 4/	1,490	32,500	21.80
Other specified uses not listed 5/	(6/)	(6/)	1.35
Unspecified: 7/			
Actual	7,880	38,900	1.35
Estimated	(6/)	(6/)	4.90
Total	33,600	174,000	5.19

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Includes dolomite, granite, limestone, limestone-dolomite, marble, and slate.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes roofing granules, stone sand (bituminous mix or seal), stone sand (concrete), and unpaved road surfacing.

4/ Includes mine dusting or acid water treatment.

5/ Includes sulfur oxide removal.

6/ Withheld to avoid disclosing company proprietary data; included in "Total."

7/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
ALABAMA: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	35 r/	28,900 r/	$144,000 r/	$4.96 r/	40	29,500	$151,000	$5.11
Dolomite	3	W	W	5.38	3	W	W	5.14
Marble	1 r/	782	W	W	1	816	W	W
Granite	1	W	W	5.67	6	W	W	5.58
Slate	2	W	W	7.05	2	W	W	4.27
Total	XX	32,500	164,000	5.07	XX	33,600	174,000	5.19

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes limestone-dolomite reported with no distinction between the two.

TABLE 4
ALABAMA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

	District 1		District 2	
Use	Quantity	Value	Quantity	Value
Construction aggregates:				
Coarse aggregate (+1 1/2 inch) 3/	W	W	W	W
Coarse aggregate, graded 4/	W	W	W	W
Fine aggregate (-3/8 inch) 5/	W	W	W	W
Coarse and fine aggregate 6/	2,920	13,100	3,310	16,600
Other construction materials	4,590	21,400	6,500	29,900
Agricultural 7/	(8/)	(8/)	(8/)	(8/)
Chemical and metallurgical 9/	--	--	4,580	13,500
Special 10/	--	--	1,490	32,500
Other miscellaneous uses 11/	--	--	(8/)	(8/)
Unspecified 12/				
Actual	1,040	4,160	6,840	34,800
Estimated	(8/)	(8/)	(8/)	(8/)
Total	8,810	39,800	24,800	134,000

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Production reported in District 3 was included with "District 2" to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, crusher run (select material or fill), other coarse and fine aggregates, and roofing granules.

7/ Includes agricultural limestone and poultry grit and mineral food.

8/ Withheld to avoid disclosing company proprietary data; included in "Total."

9/ Includes cement manufacture, dead-burned dolomite manufacture, and lime manufacture.

10/ Includes mine dusting or acid water treatment and other fillers or extenders.

11/ Includes other specified uses not listed and sulfur oxide removal.

12/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
ALABAMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand) 2/	4,130	$16,500	$3.99
Concrete products (blocks, bricks, pipe, decorative, etc.)	255	1,390	5.43
Asphaltic concrete aggregates and other bituminous mixtures	660	2,100	3.18
Road base and coverings 3/	853	3,830	4.49
Fill	200	686	3.43
Railroad ballast	1	3	3.00
Other 4/	394	2,090	5.31
Unspecified: 5/			
Actual	2,550	12,100	4.76
Estimated	2,850	10,700	3.75
Total or average	11,900	49,400	4.15

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (lime) and snow and ice control.

4/ Includes filtration and roofing ganules.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
ALABAMA: CONSTRUCTION SAND AND GRAVEL 1/ SOLD OR USED IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

Use	District 2		District 3		Unspecified within all districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 3/	1,390	7,070	3,000	10,800	--	--
Asphaltic concrete aggregates and road base materials 4/	698	3,430	1,010	3,180	--	--
Railroad ballast	--	--	1	3	--	--
Other miscellaneous uses 5/	175	986	218	1,110	--	--
Unspecified: 6/						
Actual	16	65	2,270	11,000	261	1,020
Estimated	912	3,350	1,940	7,350	--	--
Total	3,190	14,900	8,440	33,400	261	1,020

1/ Production reported in "District 1" was included with "District 2" to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

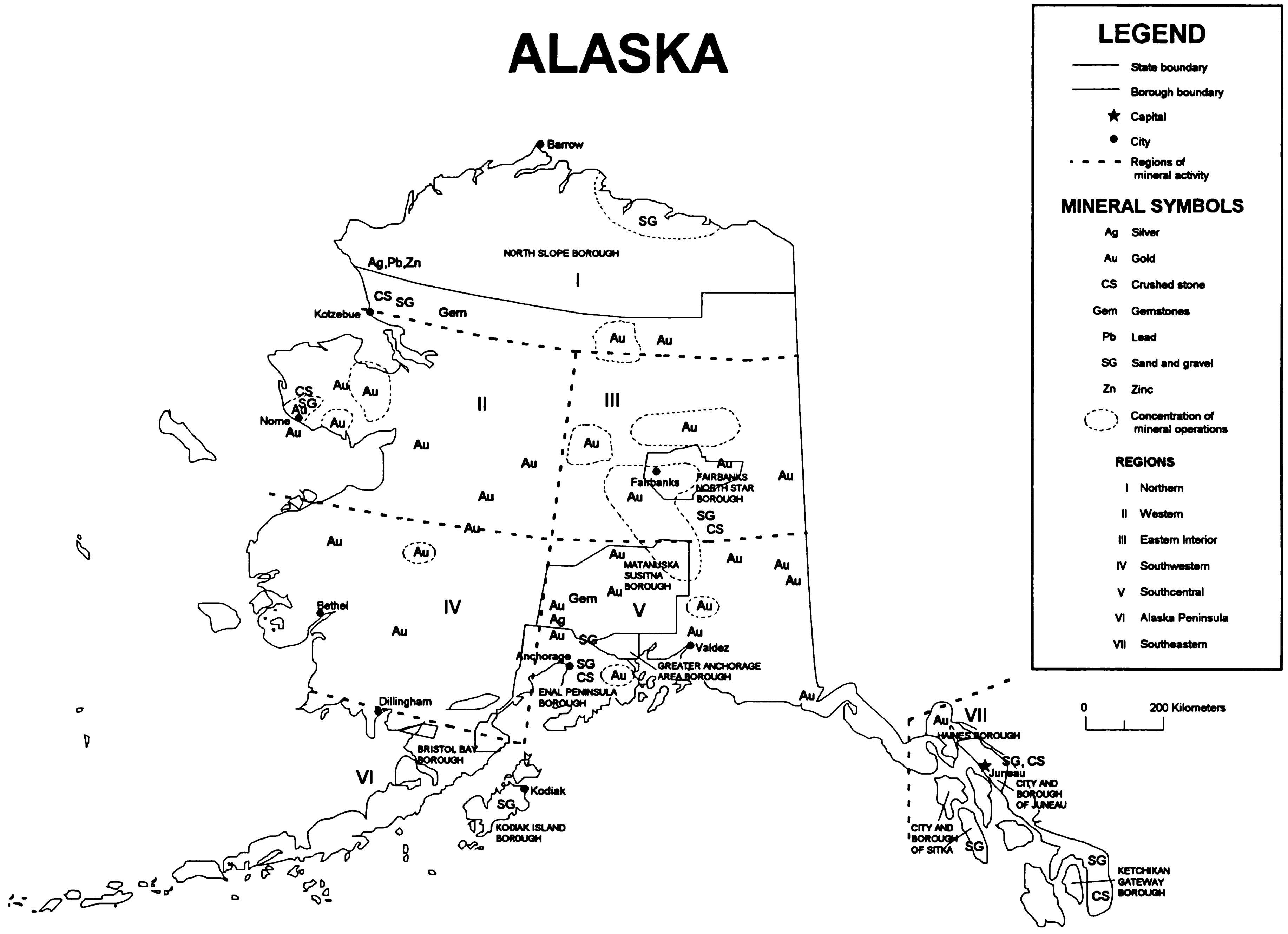
3/ Includes plaster and gunite sands.

4/ Includes fill, road and other stabilization (lime), and snow and ice control.

5/ Includes filtration and roofing granules.

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

ALASKA



Source: Alaska Division of Geological and Geophysical Surveys/U.S. Geological Survey

THE MINERAL INDUSTRY OF ALASKA

In 1996, Alaska had an estimated $523 million in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). However, the dollar value totals for 1995-96, as given in table 1, are artificially low because data have been withheld to avoid disclosing company proprietary data. With these data included, the State would have ranked 22d among the 50 States in 1996 and 20th in 1995. In addition, Alaska's nonfuel mineral production value showed an increase rather than a decrease (as shown in table 1) from 1995 to 1996. The State accounted for approximately 1.5% of the U.S. total nonfuel mineral production value.

Overall, metallic minerals accounted for more than 85% of the State's total nonfuel mineral production value, and the large majority of this was from zinc, lead, and silver production at the Red Dog Mine in northwestern Alaska. Compared with data for 1995, the production values of all the State's nonfuel minerals increased in 1996 except for that of zinc.

Based on USGS estimates of the quantities produced in the 50 States during 1995, Alaska remained first in zinc, second in lead, fifth in silver, and seventh[2] of the 13 gold-producing States. Additionally, significant quantities of construction sand and gravel were produced from the State's mine pits. Production of peat was not reported to the USGS, in part because of reporting difficulties associated with the seasonal, intermittent nature of the mineral commodity's mining in the State. The Alaska Department of Natural Resources' Division of Geological and Geophysical Surveys (DGGS) estimated peat production to be about 29,000 cubic meters (38,000 cubic yards) for a value of $175,000.

The following narrative information was provided by the DGGS.[3] Based on DGGS estimates, increases occurred in all three mine-related activity categories: exploration increased 30% over the 1995 value to $44.5 million, development was up 165% to $394 million, and production increased 10% to $591 million (includes coal and peat production). For the first time, the cumulative value of the Alaska mineral industry, as measured by the sum of exploration and development expenditures and the value of production, exceeded $1 billion.

Promising Alaska exploration and development projects include the Kensington gold mine near Juneau, the True North gold property near Fairbanks, the Donlin Creek gold prospect near Flat, the Pogo gold prospect near Delta Junction, and the Calder Island limestone and the Niblack polymetallic projects on Prince of Wales Island.

The Alaskan minerals industry provided an estimated 3,750 full-time equivalent jobs in 1996, an increase of about 340 or 10% from the 3,400 Alaskan mine-related jobs in 1995. Most of the job increases were attributed to: (1) new hardrock mine employment at the Greens Creek polymetallic mine near Juneau and the Nixon Fork gold-copper mine near McGrath; (2) mineral development projects at the Red Dog zinc-lead-silver mine near Kotzebue, the Illinois Creek gold project near Galena, and the Fort Knox gold project near Fairbanks; and (3) new exploration jobs statewide. Contrasting the increases in hardrock mineral-related job opportunities was a decrease in employment at placer gold mines.

According to DGGS, the value of 1996 Alaska mineral production increased by an estimated $53.8 million or nearly 10% above the 1995 value. Overall value for metallic products climbed from $443 million in 1995 to $495 million in 1996, a 12% increase. DGGS reported that about 350 metric tons[4] of copper valued at more than $800,000 was produced as a byproduct in two new hardrock mines—the first copper credited from Alaskan mines in nearly four decades. The value of Alaska's industrial minerals production increased in 1996. In addition to crushed stone and construction sand and gravel, $25,000 worth of jade and soapstone were produced.

During 1996, Cominco Alaska Inc. mined almost 2.1 billion tons of zinc-lead-silver ore at the Red Dog open pit mine. Cominco shipped 586,700 tons of zinc concentrate, and 107,500 tons of lead concentrates from the port site near Kivalina to Canadian, Circum-Pacific, and European smelters. Red Dog remained the world's largest zinc producer and accounted for approximately 7% of the world's mine-produced zinc. Improved performance of the mill resulted in a 2% increase in concentrate output from 1995 to 1996 even though the amount of ore processed during the same time period decreased by 7%. Approximately 80% of the 417 employees on the Red Dog payroll were Alaskan residents; about 50% were shareholders of NANA Corp., the owner of the deposit.

Kennecott Greens Creek Mining Co. reopened the Greens Creek polymetallic mine on Admiralty Island near Juneau in July 1996, nearly 6 months ahead of schedule. The underground mine had operated from 1989 to the first quarter of 1993, but closed down due to low metal prices. From July to the end of December, Kennecott mined 122,470 tons of ore and produced more than 39,000 tons of concentrates that contained (payable) 77,004 kilograms (kg) silver, 233 kg gold, 8,255 tons zinc, 3,810 tons lead and 193.4 tons copper. About 265 people worked at Greens Creek Mine during the 1996 mine production phase. Annually, Greens Creek Mine was expected to produce about 1,930 kg gold, 342,000 kg silver, 36,300 tons zinc, 18,150 tons lead, and byproduct copper when in full production, making it one of the largest silver mines in North America.

Based on information supplied in DGGS questionnaires, Alaska Placer Mining Application submittals, and telephone surveys, an estimated 144 placer and 3 lode mines produced approximately 5,020 kg gold (see footnote 2) worth $61.0 million in 1996, an increase of 14% in quantity and 13% in value from 1995 levels. Approximately 1,930 kg (38%) of Alaskan gold was from ore mined at lode mines and 3,090 kg (or 62%) was from placer sources. The number of operating placer mines in 1996 was about the same as that of the previous year. However, the big drop in placer production—from 4,220 kg gold in 1995 to 3,090 kg gold in 1996—was mainly due to the 1995 closure of the Cambior Alaska's Valdez Creek Mine near Cantwell, which had been the State's largest gold mine for 12 years. The placer industry, which provided 825 jobs in 1996, has stabilized and is not expected to decline further.

Nixon Fork Mining Co., the operating subsidiary for Consolidated Nevada Goldfields Inc., mined and milled 36,197 tons of ore and produced about 1,200 kg gold and about 161,000 kg of byproduct copper at the Nixon Fork Mine. Nixon Fork, about 45 kilometers northeast of McGrath in the western region, became Alaska's largest gold mine in 1996. The company employed 71 year-round employees that operate on a 2 week-1 week swing-shift schedule. An estimated 65% of the employees were Alaskan residents, and 10% were from nearby villages. The operation was entirely supported by aircraft and the gold-copper concentrates are sent to smelting facilities of Dallo Inc. at Kosaka, Japan.

Fairbanks Gold Mining Inc. (FGMI), operating subsidiary for Amax Gold Inc., initiated gold production at the Fort Knox gold mine 24 kilometers northeast of Fairbanks in the eastern interior region. At year's end, FGMI provided 243 year-round jobs. About $76 million will be added to the Alaskan economy annually, which includes a $300,000 weekly payroll and multimillion dollar electric utility costs paid to Golden Valley Electric Association.

Alaska Gold Co. processed 497,000 cubic meters of pay gravels and produced 731 kg gold from open pit mining operations in the Cape Nome District in the western region.

Cripple Creek Venture, a joint venture between mine operator Yellow Eagle Mining Inc. and Exploration Orbite V.S.P.A. Inc., developed Alaska's first new large-scale placer mine near Ester in the Fairbanks district; active mining took place from June to November 1996.

The ten top Alaskan gold producers in 1996 were: Nixon Fork Mining Co. (McGrath-McKinley District); Alaska Gold Co. (Cape Nome District); Fairbanks Gold Mining Inc. (Fairbanks District); Polar Mining Inc. (Fairbanks District); Alaska Placer Development (Livengood-Tolovana District); Kennecott Greens Creek Mining Co. (Juneau-Admiralty District); Yellow Eagle Mining Inc. (Fairbanks District); the Clark-Wiltz Partnership (Innoko-Tolstoi District); Little Eldorado Group (Fairbanks District); and Ed Lapp and Sons Inc. (Circle District). These companies produced (by DGGS estimates) more than 3,700 kg gold or 74% of the Statewide total for the year.

Sealaska Corp. initiated a promising new industrial mineral export project at its limestone property near Calder on Prince of Wales Island in the southeastern region. Mining and processing of a 12-million-ton calcium carbonate deposit are expected to begin in the first quarter of 1997. Initial products will consist of ground calcium carbonate for horticultural, environmental and industrial applications and crushed and screened material for wallboard, roofing, and animal feed manufacturing. The significance of Sealaska's ground-breaking effort is that it will be the first project in nearly 20 years to export industrial minerals to markets outside the boundaries of the State.

Peat and top soil production, which is used exclusively for horticultural purposes, was reported from eight companies located in Anchorage, Palmer, Wasilla, Delta Junction, and Fairbanks. Great Northwest Inc. in Fairbanks, Sunshine Services of Delta Junction, and Landscape Supply Corp. in Wasilla were among the top producers in 1996.

Construction activities at the Red Dog Mine near Kotzebue, the Fort Knox Mine near Fairbanks, the Illinois Creek Mine near Galena, the Nixon Fork Mine near McGrath, and the Greens Creek, Kensington and Alaska-Juneau Mines near Juneau increased development expenditures in 1996 to $394 million, compared with about $149 million in 1995. The 1996 mineral development cost estimate exceeded the previous high of $275 million spent in 1988, when the Red Dog and Greens Creek Mines were under construction.

Mineral exploration activities in the southcentral region focused on evaluation of hardrock mineral deposits. Southwestern Alaska saw some of the most active exploration in 1996, with reported expenditures of $11.6 million, a fourfold increase over the $2.45 million spent in 1995. The pace of exploration was slower in southeastern Alaska in 1996 than it was in the early 1990's and was less dominated by a few operations. About $7.2 million was spent, only about 60% as much as the $12.2 million in exploration expenditures reported in 1995. Although there was no placer thawfield drilling, most regions reported considerable hardrock drill activity, and all was core drilling in the northern, southwestern and southeastern regions. The total drilled, more than 222,240 meters, is more than in any year since 1990.

Exploration increased dramatically in the eastern interior with activity reported from Tanana in the west to the Canadian border. Expenditures were at least $18.3 million, up 72% from $10.6 million in 1995. Much of the mineral exploration in the eastern interior took place near Fairbanks. The largest program was that of Newmont Exploration Ltd. at the True North gold property about 24 kilometers north of Fairbanks. This project was part of a joint venture owned by La Teko Resources Ltd.

In western Alaska, exploration expenditures were $3.8 million in 1996, slightly less than the $4.7 million spent the previous year. Kennecott Exploration Co. conducted an airborne geophysical survey in the Candle area of the Seward Peninsula, but most of its efforts were spent drilling the Aurora, Lindblom, and Bonanza Hill properties and trenching mineralized zones at the Mount Distin property. The Alaska Gold Co. conducted an active exploration program, including 9,140 meters of reverse-circulation drilling near Nome. Nova Natural Resources Corp. was persuing subsea placer operations in the Nome area with a mobile suction dredge similar to the "Tamrod" that was tested by Westgold, Ltd. several years ago. In the McGrath area there was a flurry of exploration and staking spurred by the exploration at Donlin Creek, near Crooked Creek.

In northern Alaska, Cominco Alaska Exploration Inc. at the Red Dog Mine intercepted deposits of zinc ranging from 12% to 20%, lead at 4%, and silver ranging from 70 to 100 grams per ton in two drill holes 120 meters apart. The thickness of the deposits ranged from 58 meters in the drill hole (180 meters deep) with lower mineral concentrations to 33 meters in the drill hole (220 meters deep) with higher concentrations. Definition drilling of the new ore horizon was to continue in 1997. Also in the State's northern region, WGM of Anchorage, with funding from Ventures Resource Corp., conducted a wide-ranging grassroots exploration program in the area east of Wiseman.

The total number of active Alaska state claims increased from more than 25,100 in 1995 to 38,700 in 1996, a 54% increase. The total number of active federal claims remained at about the same level of approximately 8,000 during both 1995 and 1996.

During 1996, the Alaska Legislature and Governor enacted legislation which extended the allowable underground mine shifts from 8 to 10 hours. The Governor created a special water quality working group to study and make recommendations for 12 natural resource-related criteria regulated by State and Federal agencies. These include arsenic, acute toxicity, dissolved metals, and petroleum (hydrocarbon) residual levels-all of which affect mine-related activities.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. Construction sand and gravel and crushed stone estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Gold figures in table 1, as reported to the USGS, possibly understate actual 1996 production and value. The canvassing of gold placer mineral production was discontinued by the U.S. Bureau of Mines (the Federal agency formerly responsible for U.S. nonfuel mineral production data collection) in 1994. Gold production and value for Table 1's preliminary numbers are estimated by the USGS. Final total gold production for Alaska is done in collaboration with the State. Data collected by Alaska's State government indicate production in 1996 to have been about 5,020 kilograms at about $61 million.

[3] Thomas K. Bundtzen, Senior Economic Geologist at the DGGS, coauthored with other Alaska officials the text of Alaskan minerals industry information submitted by the DGGS.

[4] All tons are metric unless otherwise specified.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ALASKA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1994		1995		1996 p/
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones	NA	10	NA	10	NA	11
Gold 3/ kilograms	5,660 4/	70,300 4/	4,410 4/	56,000 4/	4,500	56,400
Sand and gravel (construction)	15,700	56,200	13,700	48,500	14,000	51,100
Silver 3/ metric tons	W	W	109	18,100	130	22,200
Stone (crushed)	3,870	24,100	3,320 5/	20,400 5/	3,500 5/	22,200 5/
Zinc 3/ metric tons	W	W	321,000	395,000	330,000	371,000
Combined values of lead, stone [crushed dolomite and limestone (1995-96)], and value indicated by symbol W	XX	367,000	XX	(6/)	XX	(6/)
Total	XX	518,000	XX	538,000 7/	XX	523,000 7/

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Recoverable content of ores, etc.

4/ Data collected by the State.

5/ Excludes certain stones; kind and value included with "Combined value" data.

6/ Value excluded to avoid disclosing company proprietary data.

7/ Partial total, excludes values that must be concealed to avoid disclosing company proprietary data.

TABLE 2
ALASKA: 1/ CRUSHED STONE 2/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 3/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	30	$152	$5.07
Coarse and fine aggregates:			
Graded road base or subbase	38	300	7.89
Unpaved road surfacing	21	186	8.86
Other construction materials 4/	79	400	5.06
Unspecified: 5/			
Actual	225	693	3.08
Estimated	2,930	18,700	6.39
Total	3,320	20,400	6.15

1/ Data derived in part from the Alaska Geological Survey.

2/ Includes granite, miscellaneous stone, sandstone, slate, and traprock; excludes limestone-dolomite from State total to avoid disclosing company proprietary data.

3/ Data are rounded to three significant digits; may not add to totals shown.

4/ Includes concrete aggregate (coarse), screening (undesignated), and crusher run (select material or fill).

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
ALASKA: 1/ CRUSHED STONE SOLD OR USED, BY KIND 2/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone-dolomite	1	(3/)	(3/)	$10.40	1	(3/)	(3/)	$9.61
Granite	1 r/	W	W	10.00 r/	1	24	$100	4.17
Sandstone	2	W	W	2.39	--	--	--	--
Slate	1	7	$48	6.86	1	7	48	6.86
Traprock	7 r/	1,260 r/	5,310 r/	4.22 r/	5	1,030	3,230	3.15
Miscellaneous stone	13 r/	2,500 r/	18,200 r/	7.26 r/	6	2,260	17,000	7.53
Total	XX	3,870	24,100	6.24	XX	3,320	20,400	6.15

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data derived in part from the Alaska Geological Survey.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes limestone/dolomite from State total to avoid disclosing company proprietary data.

TABLE 4
ALASKA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	684	$5,590	$8.17
Plaster and gunite sands	(2/)	2	8.82
Asphaltic concrete aggregates and other bituminous mixtures	286	2,060	7.20
Road base and coverings	1,100	4,140	3.75
Fill	210	1,200	5.72
Snow and ice control	47	411	8.74
Railroad ballast	24	150	6.25
Other 3/	64	233	3.64
Unspecified: 4/ Estimated	11,200	34,700	3.09
Total or average	13,700	48,500	3.55

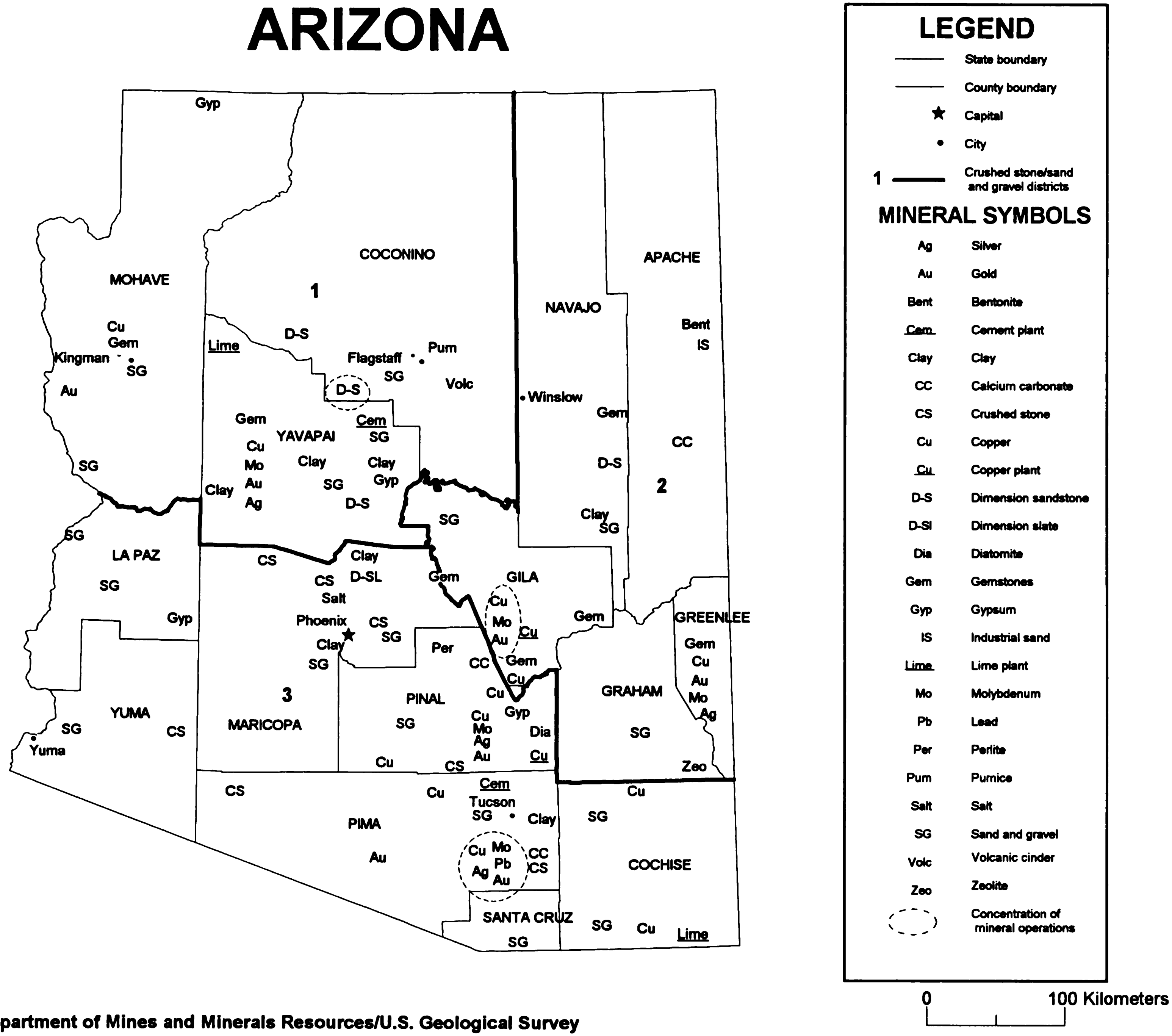
1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Less than 1/2 unit.

3/ Includes concrete products.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

ARIZONA



Source: Arizona Department of Mines and Minerals Resources/U.S. Geological Survey

THE MINERAL INDUSTRY OF ARIZONA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Arizona Department of Mines and Mineral Resources for collecting information on all nonfuel minerals.

In 1996, for the eighth time in the past 9 years, Arizona led the Nation in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). Arizona's mineral production was valued at (based on preliminary data) $3.5 billion, a 16% decrease from the $4.2 billion of 1995. This followed a 28% increase from 1994 to 1995 (based on final 1995 data). The State accounted for more than 9% of the U.S. total nonfuel mineral production value.

Arizona continued as the top copper-producing State, accounting for 65% of total U.S. copper mine production and value. Copper was the State's leading nonfuel mineral, representing 83% of Arizona's 1996 total nonfuel mineral value. The State's 1996 decrease in total nonfuel mineral production value (as well as its significant increase in 1995) mainly resulted from declines (and significant increases in 1995) in average copper and molybdenum prices, but especially those of copper. Copper production increased by more than 5% in 1996, but its value decreased by about 18%, owing to a drop in average prices. In 1995, production had increased 4%; but conversely, the red metal's value then increased nearly 30%.

Compared with 1995, the values of the following commodities increased in 1996: construction sand and gravel, portland cement, lime, silver, crushed stone, gold, masonry cement, crude gypsum, gemstones, industrial sand and gravel, dimension stone, and iron oxide pigments. In addition to copper, the values of molybdenum, salt, bentonite clay, perlite, and pumice and pumicite decreased for the year.

Based on USGS estimates of the quantities produced in the United States during 1996, Arizona remained second in silver and perlite, and fifth in portland cement and zeolites. While the State climbed from second back to first in molybdenum and from ninth to eighth in lime, it was third in gemstones and dropped from fifth to sixth in the production of pumice and pumicite. Additionally, Arizona was a significant producer of portland and masonry cement and dimension stone.

The following narrative information was provided by the Arizona Department of Mines and Mineral Resources[2] (ADMMR). The Arizona Legislature selected the Mine Inspectors Office to administer the 1994 Mine Land Reclamation Act. The act became effective January 1, 1997, for new metal exploration and mine projects.

Existing operations were given until April 1, 1997 to submit reclamation plans. The Prescott Forest tightened regulations governing mining and prospecting activities to protect Mexican spotted owls and other endangered species.

Copper

ASARCO Incorporated's Silver Bell Mine continued to produce copper by dump-leach precipitation, while construction of a new $70-million solvent extraction-electrowinning (SW-EX) plant was underway. The project was being developed with Mitsui and Co. Ltd. as a 25% partner. Production was anticipated to start in mid-to-late 1997, with a capacity of 16,000 metric tons[3] of refined cathode copper annually. Oxide ore for the project will come from a new area of the property known as Silver Bell North that contains nearly 180 million tons of reserves. Asarco, facing a bottleneck at the Hayden smelter, cut back on concentrate production at the Ray Mine's Hayden mill beginning in October. At its Mission Mine, production increased 16% owing to improved ore grades from its new underground mine.

Magma Copper Co. was acquired by Broken Hill Proprietary Co. (BHP) of Australia effective January 1996. The merger made BHP Copper the second largest copper producer in the world with 9% of mine production. San Manuel and Pinto Valley are the company's two active mining divisions in Arizona. The Magma Mine at Superior closed in June 1996. It produced 17,000 tons of copper in 1995. BHP has begun engineering and permitting for an in situ leaching and an SX-EW plant for the Poston Butte deposit at Florence.

Development of the Lower Kalamazoo ore body at San Manuel continued during 1996 and was nearly complete at yearend. Its estimated ore reserves of 950,000 tons contained copper will add 12 years to the San Manuel underground mine operations. Production was planned to be phased in parallel with the depletion of the San Manuel ore body during the period from 1997 through 1999. San Manuel became the sole producing underground copper mine in the State with the closure of the Oracle Ridge and Superior mines.

Construction of the Carlota Mine of Carlota Copper Co., a subsidiary of Cambior USA Inc., continued to be delayed. The long-awaited Environmental Impact Statement from Tonto National Forest, expected to be received by January

1996, was still not completed as of December 1996.

The ADMMR stated that the Cyprus Sierrita Corp. operated one of the most efficient mines in the world, with an average copper grade of only 0.27%, the lowest of all milling operations in the State. Sierrita contained proven and probable reserves to last 20 years at its present mining rate of almost 45 million tons of ore per year.

The Cyprus Tohono Corp. operated a SX-EW plant fed by a newly developed test open pit mining and heap-leach operation. According to the company's 10K report, in 1996, Tohono produced 17,700 tons, an increase of over 2,700 tons from that of 1995. A 540-million ton resource could become reserves if copper recovery and acid consumption remain within profitable levels. At yearend, mining from the test pit was temporarily suspended while Cyprus investigated large-scale alternatives. Leaching from existing leach pads continued.

Oracle Ridge Mining Partners, the operators of the underground Oracle Ridge Mine, suspended operations at the mine in early 1996. Santa Catalina Mining Corp., a 70% owner of the mine, reportedly has expressed the wish to sell its interest in the mine since that time. In 1995, Oracle Ridge produced concentrates containing 3,390 tons of copper from the mine.

Phelps Dodge Corp., headquartered in Phoenix, was the Nation's largest copper producer and the world's largest producer of SX-EW cathode copper. Its Morenci Mine was the largest copper producer in North America and the fourth largest copper mine in the world. According to the company's 10K report, in 1996, Morenci produced a record 462,000 tons of copper, or almost one-third of Arizona's total. More than one-half of Morenci's production was recovered by a leaching and SX-EW process. Morenci's milling and leaching reserves totaled more than 1.4 billion tons.

In 1994-95, a large resource of leachable material containing 900 million tons grading 0.27% copper was outlined north of Metcalf at the Garfield deposit. Phelps Dodge anticipated that continued drilling will result in a doubling of this resource.

Phelps Dodge Corp. and the Bureau of Land Management continued work on land exchanges for future Morenci and Safford operations. In October 1996, the final Environmental Impact Statement for the Morenci exchange was issued. In late 1995, the Sanchez deposit was acquired from AZCO Mining Inc. This increased the company's open pit, leachable copper resources in the Safford District to nearly 2.2 billion tons. Dos Pobres, in the Sanchez District, also contained 270 million tons of sulfide reserves.

The New Cornelia Mine at Ajo remained inactive,but study of the geology of the copper resource continued.New Cornelia was last reported to contain 145 million tons grading 0.56%.

Gold, Zinc, and Construction Materials

In December 1995, Addington Resources Inc. sold Addwest Minerals Inc. to a group of private investors. The company continued to operate the Gold Road Mine and mill at Oatman. The Gold Road Mine recently became the sole producing primary gold mine in Arizona.

Bema Gold Corp., owner of the Yarnell Mining Co., continued permitting efforts for its Yarnell deposit that contained 6.6 million tons with 1.3 grams per ton gold. The final Environmental Impact Statement is expected by September 1997 for the open pit heap-leach operation.

Nevada Pacific Mining Co. acquired permits for an open pit heap-leach gold operation at the Cyclopic Mine in Mohave County but had not yet announced reserve figures or a construction date.

Phelps Dodge Corp. and Cominco Ltd. announced a joint-venture agreement for the United Verde massive sulfide deposit at Jerome. Although historically a large copper producer, the property contains one of the largest zinc resources in the United States, with a 19-million-ton resource grading 6.6% zinc plus copper and precious metals. Recently, work has focused on rehabilitating the Hopewell Tunnel and performing a geologic review.

The Georgia Marble Co. opened a new marble quarry named Davidson at their Andrada operations south of Tucson. The sand and gravel industry had another big year fueled by rapid population growth and continuing strong economic activity in Arizona.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGSinformation at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Nyal J. Niemuth, Mining Engineer, authored the text of State minerals information provided by the Arizona Department of Mines and Mineral Resources.

[3] All tons are metric tons unless otherwise specified.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ARIZONA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1994		1995		1996 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
Clays		98 3/	452 3/	119	449 3/	120	454 3/
Copper 4/		1,120	2,750,000	1,170	3,560,000	1,230	2,930,000
Gemstones		NA	3,550	NA	3,230	NA	4,010
Gold 4/	kilograms	2,050	25,300	1,920	23,900	2,100	26,300
Iron oxide pigments (crude)	metric tons	77	62	68	90	W	W
Sand and gravel:							
Construction		34,800	166,000	40,100	201,000	41,900	220,000
Industrial		W	W	334	2,910	332	3,310
Silver 4/	metric tons	198	33,700	220	36,400	240	40,900
Stone (crushed)		4,970	25,000	5,520	32,600	5,600	33,600
Combined value of cement, clays (bentonite), gypsum (crude), lime, molybdenum, perlite (crude), pumice and pumicite, salt, stone (dimension sandstone), and value indicated by symbol W		XX	274,000	XX	331,000	XX	274,000
Total		XX	3,280,000	XX	4,190,000	XX	3,530,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value" data.

4/ Recoverable content of ores, etc.

TABLE 2
ARIZONA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	59	$150	$2.54
Coarse and fine aggregates:			
Graded road base or subbase	35	136	3.89
Unpaved road surfacing	59	219	3.71
Terrazzo and exposed aggregate	W	W	11.10
Crusher run or fill or waste	W	W	5.87
Other construction materials	224	1,980	8.82
Chemical and metallurgical:			
Cement manufacture	(3/)	(3/)	6.61
Flux stone	(3/)	(3/)	12.70
Special: Other fillers or extenders	(3/)	(3/)	7.72
Unspecified: 4/			
Actual	711	4,910	6.90
Estimated	3,420	18,000	5.28
Total	5,520	32,600	5.91

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Includes granite, limestone, marble, miscellaneous stone, sandstone and quartzite, and volcanic cinder and scoria.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
ARIZONA: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	7 r/	2,690 r/	$10,400 r/	$3.86 r/	4	2,550	$14,000	$5.48
Granite	13 r/	1,350 r/	8,000 r/	5.94	10	1,760	9,880	5.61
Marble	4	593	3,730	6.28	3	W	W	6.09
Sandstone and quartzite	2	125	1,550	12.40	2	158	2,310	14.60
Traprock	4	W	W	5.61	--	--	--	--
Volcanic cinder and scoria	3	45	94	2.09	4	135	416	3.08
Miscellaneous stone	2	W	W	8.47	3	W	W	7.26
Total	XX	4,970	25,000	5.03	XX	5,520	32,600	5.91

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 4
ARIZONA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 2/	--	--	--	--	59	150
Coarse and fine aggregate 3/	129	394	--	--	189	1,940
Chemical and metallurgical 4/	(5/)	(5/)	--	--	(5/)	(5/)
Special 6/	--	--	--	--	(5/)	(5/)
Unspecified: 7/						
Actual	--	--	--	--	705	4,880
Estimated	(5/)	(5/)	6	22	(5/)	(5/)
Total	1,420	8,390	6	22	4,090	24,200

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes riprap and jetty stone.

3/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, crusher run (select material or fill), and other construction materials.

4/ Includes cement manufacture and flux stone.

5/ Withheld to avoid disclosing company proprietary data; included in "Total."

6/ Includes other fillers or extenders.

7/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
ARIZONA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	12,100	$67,800	$5.62
Plaster and gunite sands	110	866	7.87
Concrete products (blocks, bricks, pipe, decorative, etc.)	487	2,470	5.07
Asphaltic concrete aggregates and other bituminous mixtures	3,740	23,900	6.39
Road base and coverings 2/	6,030	23,500	3.90
Fill	680	2,610	3.83
Railroad ballast	218	1,880	8.61
Filtration	104	537	5.16
Other	157	878	5.59
Unspecified: 3/			
Actual	9,980	45,500	4.56
Estimated	6,520	30,600	4.70
Total or average	40,100	201,000	5.00

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement and lime).

3/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
ARIZONA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	494 3/	3,430 3/	171	987	12,000	66,800
Asphaltic concrete aggregates and road base materials 4/	1,910 3/	8,060 3/	530	3,360	8,000	38,600
Railroad ballast	--	--	--	--	218	1,880
Other miscellaneous uses 5/	3	15	--	--	258	1,400
Unspecified: 6/						
Actual	226	887	--	--	9,750	44,600
Estimated	1,470	7,180	1,080	4,480	3,970	19,000
Total	4,100 3/	19,600 3/	1,780	8,830	34,200	172,000

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

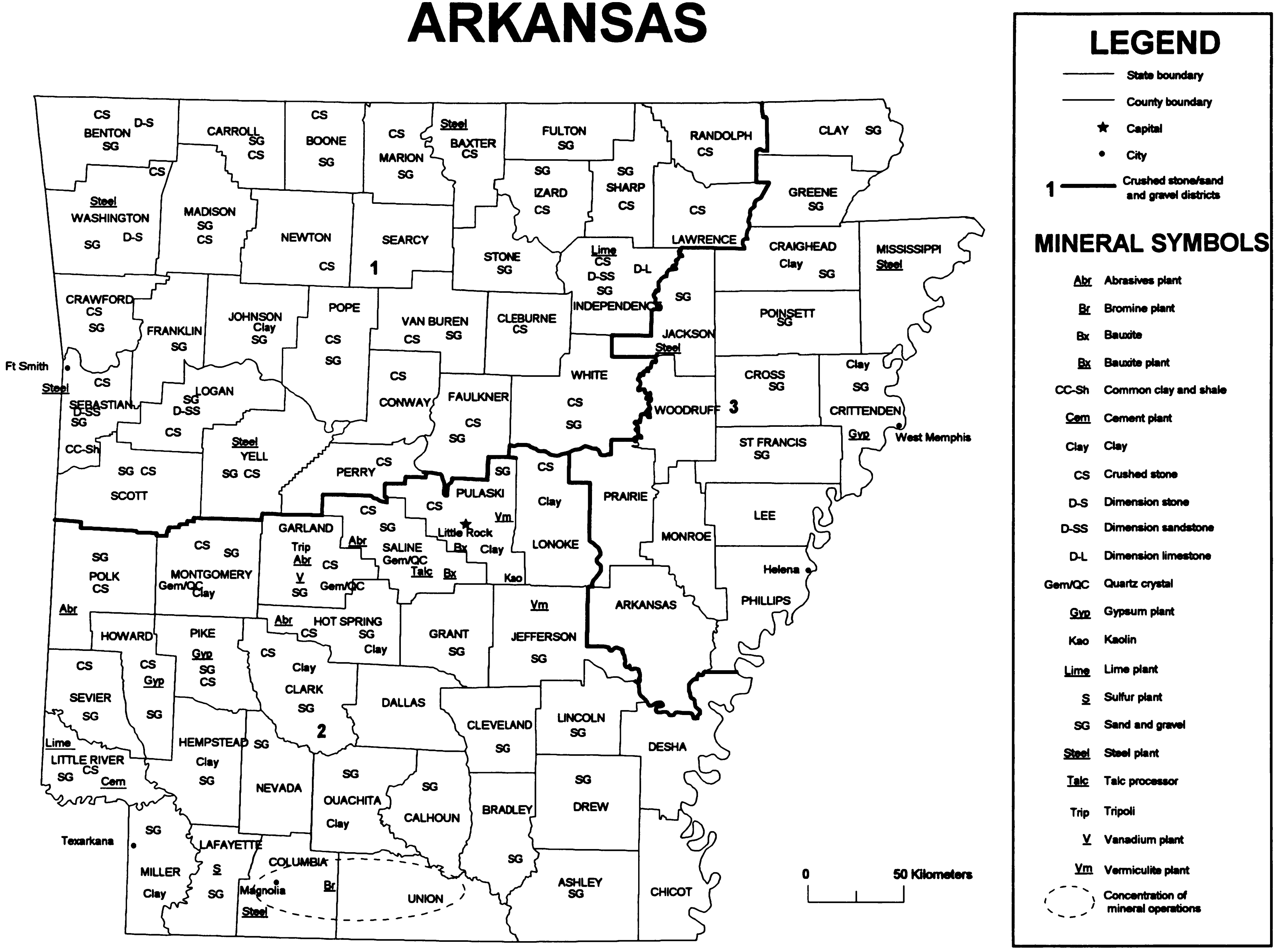
3/ Includes unspecified within all districts.

4/ Includes fill, road, and other stabilization (cement and lime).

5/ Includes filtration.

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

ARKANSAS



Source: Arkansas Geological Commission/U.S. Geological Survey

THE MINERAL INDUSTRY OF ARKANSAS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Arkansas Geological Commission for collecting information on all nonfuel minerals.

In 1996, Arkansas was 29th among the 50 States in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The State was 28th in 1995. The estimated value for 1996 was $453 million, an 8% decrease from that of 1995. This followed nearly a 13% increase from 1994 to 1995 (based on final 1995 data). The State accounted for more than 1% of the U.S. total nonfuel mineral production value.

In 1996, the Arkansas decrease in nonfuel mineral value was mainly attributable to a drop in bromine value even though its production actually increased. Mineral commodities that increased in value were crushed stone and tripoli. All other values *(see table 1)* decreased except for those of industrial sand and gravel, fire clay, and dimension stone, which remained the same. In 1995, the largest portion of Arkansas' increased nonfuel mineral value came from crushed stone. Portland cement and construction sand and gravel significantly contributed to the State's rise in value with moderate increases relative to that of crushed stone.

Based on USGS estimates of quantities produced in the 50 States during 1996, Arkansas continued to be the leading bromine-producing State, accounting for most U.S. production. Michigan was the only other State that produced bromine. Mining operations in both States extracted subsurface bromine-rich natural brines by submersible pump for subsequent processing. Arkansas also remained the only State to produce lascas; first of two silica stone-producing States; third in tripoli; fourth in kaolin; eighth in common clay; and rose from fifth to fourth in fire clay. Lascas are the feed material used to manufacture cultured quartz crystal. In addition, significant quantities of crushed stone,construction and industrial sand and gravel, crude gypsum, and dimension stone were produced in the State. The State's mines exclusively produced industrial minerals; no metal mining has been reported in Arkansas since 1991, when bauxite and vanadium ore mining ceased following decades of production. The State's metal production, mostly raw steel, resulted from materials received from other domestic and foreign sources.

The following narrative information was provided by the Arkansas Geological Commission[2] (AGC). Albemarle Corp., a major bromine producer, increased its elemental bromine production capacity in 1996 at its Columbia County plants. The company also increased its capacity for production of four bromine derivatives in 1996. Two other expansions underway were to be completed in early 1997. Strong demand continued for bromine and its derivatives in the first half of 1996, but a slow down occurred in the third quarter, due to reduced demand for brominated fire retardants in Asia. Fourth quarter demand rebounded strongly from the third quarter.

The Arkansas Department of Pollution Control and Ecology changed Regulation 15 of the Arkansas Open-Cut Mining and Land Reclamation Code to include the mining of stream-bed gravel. This change was made to comply with Act 827 of 1991, as amended by Act 1345 of 1995.

The U.S. Forest Service had 80 contracts that produced 165,600 tons[3] of building stone, riprap, and aggregate related materials (shale and chert). These projects generated about $21,000 in revenue for the Federal Government. Annual lease payments on the Ouachita National Forest (including property in Oklahoma) and the Ozark and St. Francis National Forests totaled more than $700,000. Fifty-five quartz contracts with the U.S. Forest Service on the Ouachita National Forest in Arkansas generated around $44,000 in revenue. About 680 tons of quartz was removed from these deposits.

In other developments in the State's aggregate industry in 1996, Gifford-Hill & Co. Inc. expanded its gravel operations in Nevada County. In addition, Gifford-Hill tested the Jackfork sandstone at a potential quarry site near Delight in southeast Pike County. Harbison-Walker Refractories, a division of Dresser Industries, Inc., intermittently operated the Butterfield quarry in Hot Spring County, producing high purity novaculite for refractory applications. Provo Co., based in east Texas, leased the HMB quarry (Jackfork sandstone) between Dierks and DeQueen and began processing dump material. Bill Swartz Quarries Co. in eastern Logan County increased its production of aggregate and dimension stone production over the past year. Bennett Brothers near Hot Springs Village, Garland County, expanded its market out-of-state for fieldstone and imported some decorative stone into Arkansas. Granite Mountain Hot Mix Products, a division of McGeorge Construction Co., constructed a computerized hot-mix asphalt production facility in central Pulaski County. The plant is a "double barrel" dryer-drum coater, manufactured by ASTEC Industries of Chattanooga, TN, and has a 320-ton-per-hour paving mix production capacity. Hot mix asphalt production began on July 11.

Rogers Group of Nashville, TN, bought M & M quarries (sandstone) in the Arkansas River Valley. The company also acquired the Tidwell quarry (novaculite) in Hot Spring County. Boral Gypsum Co. advertised its Briar Gypsum Plant and mine for sale, stating that the facility showed a substantial profit, but needed capital to make additional major expansions into the national market. Souter Co. abandoned the Murfreesboro, Pike County, quarry and returned its leases to Weyerhauser Co.

Lascas Products, Inc. operated the Lascas plant adjacent to the Coleman quartz mine in Garland County, but obtained its material from a mine north of the plant site.

Increased demand for tripoli kept Malvern Minerals Co. busy during 1996; minor equipment problems caused some delay in filling orders. After repairs, the company was able to meet demand and fill back orders.

Umetco began reclamation of the Christy vanadium pit near Magnet Cove in Hot Spring County in late November. The last production of vanadium ore from this site was in 1990. Reclamation was scheduled to be finished by the spring of 1997. Holnam Inc. continued reclamation and removal of processing plant structures near Saratoga, Howard County. When finished, the reclaimed mine site will add about 8 hectares to Lake Millwood.

Exploration for minerals in Arkansas was fairly active in 1996. Phase II of an exploration project at Crater of Diamonds State Park began in early October 1996 with the excavation of a number of trenches. At least 11 trenches were scheduled to recover an estimated 8,700 metric tons of material for processing. Rock removed was transported under tight security to Texas Star Resources Corp.'s testing plant northeast of the State property. Initial diamond recovery from the first half of the processing consisted of 157 diamonds, weighing a total of 36.2 carats. Processing of rock from a total of 11 trenches along with the drilling of several additional core holes on the northern edge of the pipe were scheduled for completion by early 1997. A lawsuit against Phase II testing filed in 1996 was overturned by a U.S. District Court.

A variety of other exploration projects went forward with less complications. Several companies initiated investigations in the Ouachita Mountains for lasca and high-silica end-use materials, mostly for milky and colorless quartz and novaculite. Arkhola Sand & Gravel Co. conducted exploration for additional quarry sites in the Hartshorne Sandstone in the western portion of the Arkansas River Valley. McClinton-Anchor Co. conducted an exploration program for low-silica carbonate rock in northwest Arkansas to be used for aggregate, ag-lime, and road base. Rock Products Co. of Heber Springs, Cleburne County, explored for additional sandstone quarry sites in White and Cleburne Counties. Texas Industries Group leased property in southern Polk County for the Hatton Tuff (a lentil rock body in the Mississippian Stanley Shale) and began testing to evaluate the rock. Bobby Plant Asphalt Co., based in Murfreesboro, conducted exploration and development work for a quarry south of Kirby in central Pike County.

The Center for Energy, Natural Resources, and Environmental Studies (CENRES) at Arkansas Tech University, Russellville, continued to study the relationships between the various geologic units being quarried in north Arkansas and certain engineering properties of the rock, principally as determined by the Los Angeles abrasion and sodium sulfate soundness tests. Cooperating in this study by supplying base maps and engineering test data to CENRES were the AGC, the Arkansas Highway and Transportation Department, and the U.S. Corps of Engineers.

The AGC completed the mapping of 10-7½ minute topographic quadrangles in southwest Arkansas, in part funded through the USGS's STATEMAP program. These maps are now available as Open-File Reports.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities, e.g., construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: http://minerals.er.usgs.gov/minerals/contacts/comdir.htm

[2] J. Michael Howard, Senior Geologist, authored the text of State minerals information provided by the Alabama Geologic Commission.

[3] All tons are metric unless otherwise specified.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ARKANSAS 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1994		1995		1996 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
Clays 3/		883	2,440	1,160	7,810	1,330	5,460
Gemstones		NA	3,950	NA	4,890	NA	W
Sand and gravel:							
Construction		10,600	42,500	11,600	48,300	11,300	46,300
Industrial		684	8,230	W	W	W	W
Silica stone 4/	metric tons	510	3,940	W	W	W	W
Stone:							
Crushed		20,800 5/	122,000 5/	25,500	169,000	26,200	176,000
Dimension	metric tons	W	W	22,000	2,010	24,300	2,010
Combined value of bromine, cement, clays [fire, kaolin (1994)], gypsum (crude), lime, stone [crushed limestone and traprock (1994), dimension limestone, marble, and sandstone (1994)], tripoli, and values indicated by symbol W		XX	254,000	XX	260,000	XX	224,000
Total		XX	437,000	XX	492,000	XX	453,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value" data.

4/ Grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

5/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
ARKANSAS: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	581	$2,630	$4.53
Filter stone	116	571	4.92
Coarse aggregate, graded:			
Concrete aggregate, coarse	829	4,300	5.18
Bituminous aggregate, coarse	672	3,370	5.01
Bituminous surface-treatment aggregate	151	914	6.05
Railroad ballast	314	2,430	7.75
Fine aggregate (-3/8 inch):			
Screening, undesignated 3/	397	1,670	4.21
Coarse and fine aggregates:			
Graded road base or subbase	2,860	12,500	4.36
Crusher run or fill or waste	363	1,740	4.79
Other construction materials 4/	103	595	5.78
Agricultural: Agricultural limestone 5/	301	2,800	9.30
Chemical and metallurgical:			
Cement manufacture	W	W	16.50
Lime manufacture	W	W	4.79
Special:			
Asphalt fillers or extenders	W	W	10.00
Other fillers or extenders	W	W	14.10
Other specified uses not listed	W	W	5.46
Unspecified: 6/			
Actual	14,200	91,700	6.45
Estimated	W	W	5.93
Total	25,500	169,000	6.64

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Includes dolomite, granite, limestone, miscellaneous stone, sandstone, and traprock.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes stone sand (bituminous mix or seal).

4/ Includes unpaved road surfacing.

5/ Includes poultry grit and mineral food, and other agricultural uses.

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
ARKANSAS: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	16	6,870	$33,500	$4.87	15	6,890	$53,700	$7.80
Dolomite	(2/)	(2/)	(2/)	(2/)	1	W	W	4.00
Granite	5	7,890 r/	58,200 r/	7.37 r/	7	10,100	75,700	7.47
Traprock	(2/)	(2/)	(2/)	(2/)	1	W	W	5.06
Sandstone	14 r/	5,500 r/	26,500 r/	4.83 r/	16	5,970	28,500	4.77
Miscellaneous stone	4 r/	563 r/	3,290 r/	5.84 r/	1	W	W	2.20
Total	XX	20,800	122,000	5.83	XX	25,500	169,000	6.64

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Excludes dolomite and traprock from State total to avoid disclosing company proprietary data.

TABLE 4
ARKANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2	
Use	Quantity	Value	Quantity	Value
Construction aggregates:				
Coarse aggregate (+1 1/2 inch) 2/	412	1,790	286	1,420
Coarse aggregate, graded 3/	1,300	6,060	667	4,960
Fine aggregate (-3/8 inch) 4/	283	1,300	113	375
Coarse and fine aggregate 5/	2,670	11,600	651	3,230
Agricultural 6/	301	2,800	--	--
Chemical and metallurgical 7/	W	W	W	W
Special 8/	W	W	--	--
Unspecified: 9/				
Actual	5,470	25,300	8,730	66,400
Estimated	W	W	W	W
Total	12,000	60,600	13,500	109,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes filter stone and riprap and jetty stone.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, and railroad ballast.

4/ Includes stone sand (bituminous mix or seal) and screening (undesignated).

5/ Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), and other construction materials.

6/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

7/ Includes cement and lime manufacture.

8/ Includes asphalt fillers or extenders, other fillers or extenders, and other specified uses not listed.

9/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
ARKANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate 2/	5,810	$25,700	$4.43
Asphaltic concrete aggregates and other bituminous mixtures	1,140	5,230	4.59
Road base and coverings 3/	695	2,180	3.13
Fill	176	660	3.75
Other 4/	10	32	3.20
Unspecified: 5/			
Actual	1,020	2,850	2.78
Estimated	2,710	11,600	4.30
Total or average	11,600	48,300	4.18

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement).

4/ Includes filtration and snow and ice control.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
ARKANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate 2/	1,610	5,750	3,890	18,600	311	1,420
Asphaltic concrete aggregates and road base materials 3/	296	964	1,430	6,020	282	1,080
Other miscellaneous uses 4/	6	23	4	9	--	--
Unspecified: 5/						
Actual	1,020	2,840	1	2	--	--
Estimated	563	2,710	736	3,250	1,410	5,670
Total	3,500	12,300	6,070	27,900	2,000	8,170

1/ Data are rounded to three significant digits; may not add to totals shown.

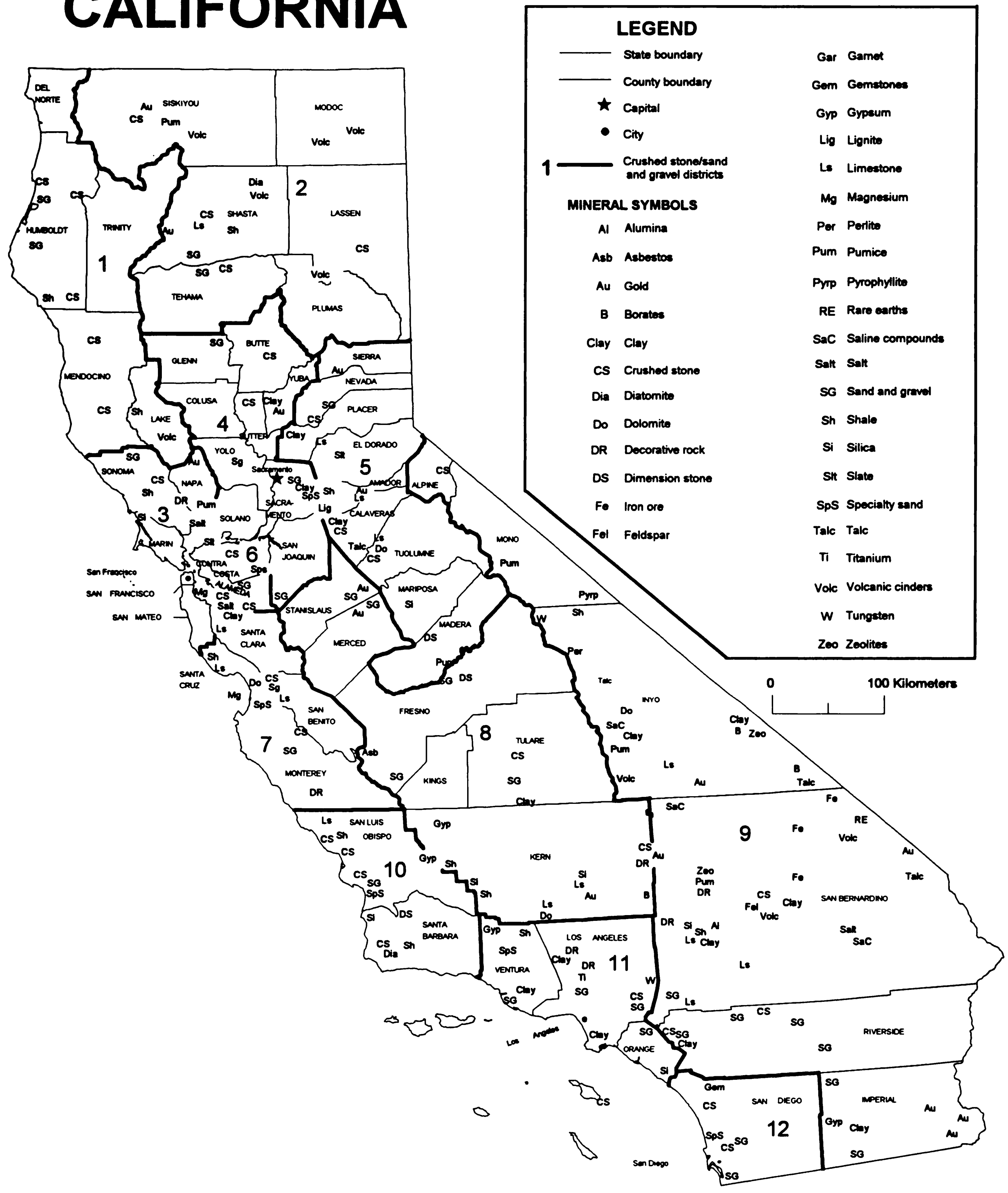
2/ Includes plaster and gunite sands.

3/ Includes fill, road, and other stabilization (cement).

4/ Includes filtration and snow and ice control.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

CALIFORNIA



Source: California Department of Conservation, Division of Mines and Geology/U.S. Geological Survey

THE MINERAL INDUSTRY OF CALIFORNIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the California Department of Conservation, Division of Mines and Geology, for collecting information on all nonfuel minerals.

In 1996, for the fifth consecutive year, California was the third leading State in the Nation in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was more than $2.8 billion, an increase of about 10% from that of 1995. This followed a less than 1% decrease from 1994 to 1995 (based on final 1995 data). The State accounted for more than 7% of the U.S. total nonfuel mineral production value.

Industrial minerals accounted for about 88% of the State's nonfuel mineral value; the remaining 12% was metals, mostly gold, silver, and tungsten. Construction sand and gravel, portland cement, boron minerals, and crushed stone, in descending order of value, were California's leading industrial minerals in 1996, accounting for more than 80% of the State's total industrial nonfuel mineral value. The increases in boron and construction sand and gravel, totaling about $230 million accounted for about 88% of the State's net increase in nonfuel mineral value during 1996. Portland cement and crushed stone values also showed substantial increases of $24 million and $18 million, respectively. Other nonfuel mineral values that increased from 1995 to 1996 included those of industrial sand and gravel, fuller's earth clays, masonry cement, magnesium compounds, feldspar, gypsum, dimension stone, kaolin, pumice and pumicite, silver, fire clays, and iron ore. The value of gold, the most prominent metal produced in the State, remained the same in 1996 as in 1995, although production decreased slightly. Nonfuel mineral values that decreased in 1996 included soda ash, salt, sodium sulfate, lime, common clays, potash, asbestos, crude perlite, gemstones, and talc. All other mineral commodities *(see table 1)* changed very slightly or remained the same in 1996.

Based on USGS estimates of the quantities produced in the United States during 1996, California continued as the Nation's only State to produce boron, rare-earth metal concentrates, tungsten, and asbestos. The State remained first in the production of construction sand and gravel, portland cement, and diatomite and first of two States that produced natural sodium sulfate. California continued to be second in gold, second of two States that produced soda ash, and tied for second with another State in the production of magnesium compounds as well as third in feldspar, pumice and pumicite, and crude perlite. Additionally, California remained fourth in industrial sand and gravel, fifth in kaolin, and sixth in fuller's earth and talc and pyrophyllite. California climbed from sixth to fifth in the production of bentonite clays, crude gypsum, and fire clays and from eighth to seventh in salt. The State dropped from third to fourth in potash and from sixth to seventh in common clays. Additionally, significant quantities of crushed stone, masonry cement, and dimension stone were produced in the State.

The following narrative information was provided by the California Department of Conservation, Division of Mines and Geology.[2] Yolo County voters passed a highly controversial mining initiative on the November ballot allowing deep pit off-channel mining along Cache Creek. The measure also shuts down in-stream mining along 24 kilometers of the creek where aggregate mining companies now operate. In addition, the measure levies a 22-cents-per-metric-ton assessment to be used for creek restoration, long-term monitoring programs, and county administration. Five new mining permits were approved by Yolo County's Board of Supervisors 3 weeks after the election. Collectively, the new permits add 113 million metric tons[3] of sand and gravel reserves, about 15% of the county's total reserves.

Permits for new and expanded sand and gravel operations were granted by several city, county, and federal agencies throughout California. CalMat Co. was granted a permit for consolidation and expansion of sand and gravel mining in and along the San Joaquin River in Fresno County. This will add roughly 18 million tons of reserves to the Fresno area. A joint mining permit was approved for Teichert Aggregates and Granite Construction Co. along Morrison Creek, Sacramento County, to extract 62 million tons of sand and gravel over a period of 20 years. Triangle Rock Products, a CalMat Co. subsidiary, received a permit to dredge 17 million tons of concrete-grade sand and gravel over a period of 11 years at its Irvine Lake dredging facility in Orange County. Triangle Rock began full on-line operations in March.

A new permit was granted to Specialty Minerals Inc. that substantially expanded its Marble Canyon-Arctic Canyon limestone mining operations in San Bernardino County. The 60-year permit allows for 52 million tons of industrial- grade limestone to be extracted from two adjacent sites.

Siting and permitting of mine operations continued to create local controversy. Several applications for aggregate mining were denied throughout the State because of land use competition and a wide range of environmental concerns.

California's leading gold producer from 1987 through 1995, Homestake Mining Co.'s McLaughlin Mine in Lake, Napa, and Yolo Counties, completed mining its ore body in June. (Santa Fe Pacific Gold Corp.'s Mesquite Mine, Imperial County, became the State leader in 1996.) The processing of stockpiled ore was scheduled to continue at the McLaughlin Mine for about the next 10 years. Mining also ceased at MK Gold Co.'s American Girl Mine, Imperial County. Heap leaching was to continue during the reclamation period into 1998. In Inyo County, CR Briggs Corp. commenced mining in late 1995 at the Briggs Mine, an open pit heap-leach gold mine owned by Canyon Resources Corp. The mine celebrated its first gold pour in October 1996. Rand Mining Co., a subsidiary of Glamis Gold Ltd., completed phase 1 of its 54-million-ton gold heap-leach pad and recovery plant in Kern County. The facility is part of the Rand Project, a mine and plant expansion approved in 1995 that added about 54 million tons of ore to and extended the life of the Rand Mine complex by 9 to 10 years. In the first phase, the pad and plant will treat and process about 18 million tons of ore.

Avocet Tungsten Inc.'s ammonium paratungstate plant in Bishop, Inyo County, continued to process tungsten ore from foreign sources. The Pine Creek Mine (50% Avocet Mining PLC, 50% Strategic Minerals Corp.) Remained under care and maintenance throughout the year.

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[1] The terminologies "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of Feb. 1997. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement) estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone, handset and request Document # 1000 for a telephone listing of all mineral commodity specialists or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Susan Kohler-Antablin, Associate Geologist, authored the text of information provided by the California Department of Conservations's Division of Mines and Geology.

[3] All tons are metric tons unless otherwise specified.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN CALIFORNIA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1994		1995		1996 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
Asbestos	metric tons	8,990	4,200	W	W	9,160	W
Boron minerals (B2O3)	do.	550,000	443,000	796,000	372,000	622,000	498,000
Cement:							
Masonry		99	6,830	154	11,200	161	11,700
Portland		9,640	539,000	9,360	565,000	9,780	589,000
Clays 3/		1,570	20,600	1,810	28,800	1,620	25,800
Diatomite		W	W	318	W	322	W
Gemstones		NA	1,710	NA	490	NA	468
Gold 4/	kilograms	30,100	373,000	26,200	326,000	26,000	326,000
Lime		203	16,900	228	15,600	172	11,700
Rare-earth metal concentrates	metric tons	20,700	W	22,200	W	22,200	W
Sand and gravel:							
Construction		96,300	523,000	98,400	542,000	112,000	646,000
Industrial		1,740	39,400	1,710	38,300	1,690	39,400
Silver 4/	metric tons	11	1,910	13	2,100	28	4,770
Stone:							
Crushed		41,100	258,000	43,700 5/	268,000 5/	46,200 5/	286,000 5/
Dimension	metric tons	11,100 5/	4,030 5/	27,300	6,660	30,300	6,700
Combined value of clays (fuller's earth, kaolin), copper (1996), feldspar, gypsum (crude), iron ore (usable), magnesium compounds, mercury, perlite (crude), potash, pumice and pumicite, salt, soda ash, sodium sulfate (natural), stone [crushed dolomite and shell (1995-96), dimension limestone, sandstone, slate and miscellaneous (1994)], talc and pyrophyllite, titanium [ilmenite (1994)], tungsten, and values indicated by symbol W		XX	364,000	XX	399,000	XX	391,000
Total		XX	2,590,000	XX	2,580,000	XX	2,840,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value" data.

4/ Recoverable content of ores, etc.

5/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
CALIFORNIA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	1,080	$9,090	$8.40
Filter stone	309	1,570	5.08
Other coarse aggregate	28	148	5.29
Coarse aggregate, graded:			
Concrete aggregate, coarse	998	5,810	5.82
Bituminous aggregate, coarse	1,070	6,390	6.00
Bituminous surface-treatment aggregate	509	8,140	16.00
Railroad ballast	662	5,160	7.80
Other graded coarse aggregate	W	W	9.93
Fine aggregate (-3/8 inch):			
Stone sand, concrete	491	2,590	5.28
Stone sand, bituminous mix or seal	305	2,480	8.11
Screening, undesignated	490	2,800	5.72
Other fine aggregate	W	W	4.78
Coarse and fine aggregates:			
Graded road base or subbase	4,410	23,700	5.37
Unpaved road surfacing	78	513	6.58
Terrazzo and exposed aggregate	83	963	11.60
Crusher run or fill or waste	1,390	4,900	3.52
Other coarse and fine aggregates	W	W	4.30
Other construction materials 3/	896	6,110	6.82
Agricultural: Poultry grit and mineral food 4/	87	1,420	16.30
Chemical and metallurgical: Cement manufacture 5/	8,970	34,100	3.81
Special:			
Asphalt filler or extenders	(6/)	(6/)	14.30
Whiting or whiting substitute	(6/)	(6/)	31.30
Other specified uses not listed 7/	895	24,500	27.40
Unspecified: 8/			
Actual	9,160	59,100	6.46
Estimated	11,800	68,800	5.85
Total	43,700	268,000	6.14

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Includes dolomite, granite, limestone, miscellaneous stone, sandstone and quartzite, slate, traprock, and volcanic cinder and scoria; excludes marble and shell from State total to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes drain fields and roofing granules.

4/ Includes agricultural limestone and other agricultural uses.

5/ Includes glass manufacture and sulfur oxide removal.

6/ Withheld to avoid disclosing company proprietary data; included with "Other specified uses not listed."

7/ Includes flour (slate).

8/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
CALIFORNIA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994				1995			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	34 r/	23,300	$148,000 r/	$6.37	22	23,200	$131,000	$5.64
Dolomite	4	208	1,550	7.47	8	237	1,920	8.11
Marble	1	W	W	5.25	(2/)	(2/)	(2/)	(2/)
Shell	1	W	W	7.71	(2/)	(2/)	(2/)	(2/)
Granite	56 r/	5,580 r/	27,800 r/	4.97 r/	19	4,720	25,200	5.34
Traprock	22 r/	6,480 r/	45,200 r/	6.99 r/	21	7,390	52,900	7.16
Sandstone and quartzite	7 r/	737 r/	4,610 r/	6.26 r/	6	863	5,810	6.73
Slate	2	W	W	8.89	3	160	1,790	11.20
Volcanic cinder and scoria	47	487	2,100	4.31	4	332	2,060	6.19
Miscellaneous stone	75 r/	3,950 r/	26,000 r/	6.60 r/	21	6,770	47,800	7.06
Total	XX	41,100	258,000	6.29	XX	43,700	268,000	6.14

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Excludes marble and shell from State total to avoid disclosing company proprietary data.

TABLE 4
CALIFORNIA: 1/ CRUSHED STONE 2/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 3/

(Thousand metric tons and thousand dollars)

Use	District 2		District 3		District 5		District 6		District 7	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:										
Coarse aggregate (+1 1/2 inch) 4/	231	1,230	475	4,180	363	2,980	W	W	W	W
Coarse aggregate, graded 5/	(6/)	(6/)	W	W	412	2,980	784	9,430	W	W
Fine aggregate (-3/8 inch) 7/	(6/)	(6/)	W	W	115	875	W	W	363	1,570
Coarse and fine aggregate 8/	432	2,250	1,640	8,990	1,040	5,590	1,560	7,770	981	4,090
Other construction materials 9/	--	--	778	7,570	290	2,300	385	2,750	992	4,680
Agricultural 10/	(6/)	(6/)	--	--	--	--	--	--	(6/)	(6/)
Chemical and metallurgical 11/	(6/)	(6/)	--	--	--	--	--	--	(6/)	(6/)
Special 12/	--	--	--	--	(6/)	(6/)	--	--	--	--
Other miscellaneous uses 13/	(6/)	(6/)	--	--	--	--	(6/)	(6/)	--	--
Unspecified: 14/										
Actual	--	--	--	--	(6/)	(6/)	(6/)	(6/)	2,770	19,200
Estimated	66	394	331	2,140	981	5,870	338	1,450	547	3,280
Total	1,470	8,420	3,220	22,900	3,270	21,800	3,070	21,500	8,570	45,000

Use	District 8		District 9		District 10		District 11		District 12	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:										
Coarse aggregate (+1 1/2 inch) 4/	--	--	W	W	(6/)	(6/)	(6/)	(6/)	--	--
Coarse aggregate, graded 5/	--	--	436	3,700	--	--	(6/)	(6/)	--	--
Fine aggregate (-3/8 inch) 7/	(6/)	(6/)	W	W	(6/)	(6/)	(6/)	(6/)	--	--
Coarse and fine aggregate 8/	--	--	24	265	(6/)	(6/)	(6/)	(6/)	240	1,260
Other construction materials 9/	--	--	259	1,530	--	--	--	--	--	--
Agricultural 10/	--	--	(6/)	(6/)	(6/)	(6/)	--	--	--	--
Chemical and metallurgical 11/	(6/)	(6/)	(6/)	(6/)	(6/)	(6/)	--	--	--	--
Special 12/	--	--	(6/)	(6/)	(6/)	(6/)	--	--	--	--
Other miscellaneous uses 13/	--	--	160	2,280	--	--	--	--	--	--
Unspecified: 14/										
Actual	1	9	2,760	14,400	--	--	3,570	25,200	--	--
Estimated	4,320	25,100	2,900	19,300	130	866	1,780	8,150	382	2,290
Total	6,230	33,700	10,700	72,100	269	2,400	6,230	37,000	622	3,550

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Excludes marble and shell from State total to avoid disclosing company proprietary data.

2/ Production reported in District 1 was included with "District 2" and District 4 was included with "District 5" to avoid disclosing company proprietary data.

3/ Data are rounded to three significant digits; may not add to totals shown.

4/ Includes filter stone, riprap and jetty stone, and other coarse aggregate.

5/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

6/ Withheld to avoid disclosing company proprietary data; included in "Total."

7/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

8/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

9/ Includes drain fields and roofing granules.

10/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

11/ Includes cement manufacture, glass manufacture, and sulfur oxide removal.

12/ Includes asphalt fillers or extenders, and whiting or whiting substitute.

13/ Includes flour (slate) and other specified uses not listed.

14/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
CALIFORNIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	27,700	$160,000	$5.77
Plaster and gunite sands	2,740	18,500	6.75
Concrete products (blocks, bricks, pipe, decorative, etc.)	1,110	11,400	10.30
Asphaltic concrete aggregates and other bituminous mixtures	12,100	80,600	6.63
Road base and coverings 2/	12,400	57,900	4.68
Fill	4,520	18,700	4.13
Snow and ice control	32	156	4.88
Other 3/	1,020	6,270	6.17
Unspecified: 4/			
Actual	22,100	109,000	4.95
Estimated	14,700	79,800	5.42
Total or average	98,400	542,000	5.51

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Includes filtration, railroad ballast, and roofing granules.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
CALIFORNIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	475	3,540	297	1,410	810	7,150	4,990	29,400
Asphaltic concrete aggregates and other bituminous mixtures	499	5,900	262	2,180	(3/)	(3/)	2,980	23,000
Road base materials 4/	629	3,930	555	2,190	565	3,990	4,360	19,900
Other miscellaneous uses 5/	60	225	(3/)	(3/)	(3/)	(3/)	302	1,460
Unspecified: 6/								
Actual	17	61	(3/)	(3/)	--	--	8	17
Estimated	251	2,080	866	4,720	--	--	3,090	19,600
Total	1,930	15,700	2,020	10,600	1,520	12,500	15,700	93,300

Use	District 5		District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	828	5,580	3,210	24,100	1,630	12,500	2,890	13,900
Asphaltic concrete aggregates and other bituminous mixtures	436	2,740	1,820	12,500	(3/)	(3/)	1,230	6,420
Road base materials 4/	754	4,380	2,230	12,000	641	2,320	2,110	9,330
Other miscellaneous uses 5/	224	1,600	88	588	(3/)	(3/)	41	452
Unspecified: 6/								
Actual	--	--	1,990	4,110	225	1,740	2,090	10,700
Estimated	1,900	9,030	--	--	47	272	660	3,720
Total	4,140	23,300	9,340	53,300	2,680	18,000	9,020	44,500

Use	District 9		District 10		District 11		District 12	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	4,450	22,500	(3/)	(3/)	9,010	48,600	(3/)	(3/)
Asphaltic concrete aggregates and other bituminous mixtures	2,920	12,300	(3/)	(3/)	1,400	10,400	419	2,930
Road base materials 4/	2,410	8,570	519	1,260	1,410	5,520	720	3,310
Other miscellaneous uses 5/	140	562	--	--	(7/)	1	--	--
Unspecified: 6/								
Actual	4,710	21,200	--	--	9,190	49,200	(3/)	(3/)
Estimated	2,140	11,100	599	3,450	1,860	8,030	3,330	17,800
Total	16,800	76,300	2,330	14,500	22,900	122,000	10,100	58,200

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

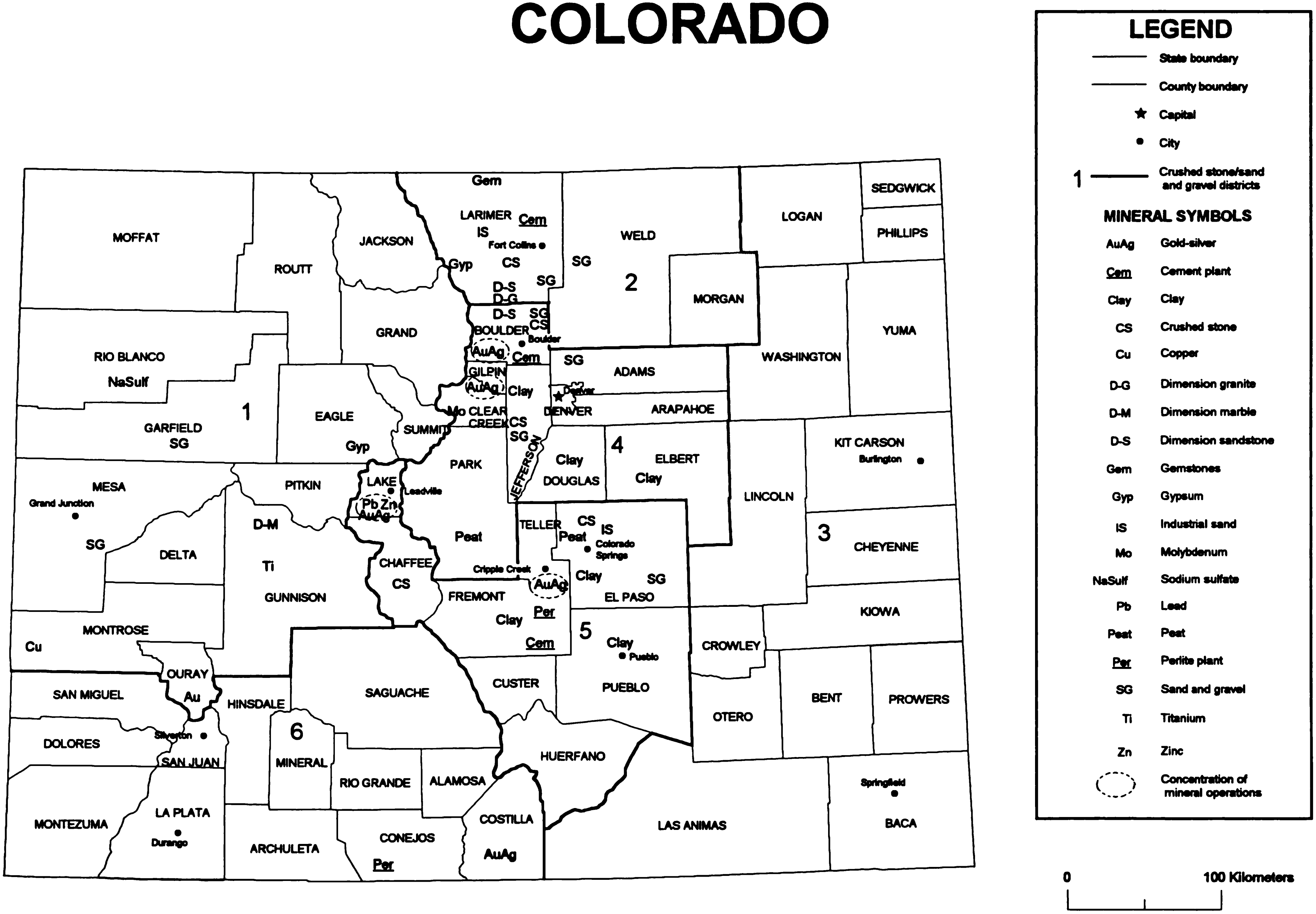
4/ Includes fill, road and other stabilization (cement), and snow and ice control.

5/ Includes filtration, railroad ballast, and roofing granules.

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

7/ Less than 1/2 unit.

COLORADO



Source: Colorado Geological Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF COLORADO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Colorado Geological Survey for collecting information on all nonfuel minerals.

In 1996, for the second consecutive year, Colorado ranked 23d among the 50 States in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $528 million, a 7.4% decrease from that of 1995. This followed a 39% increase from 1994 to 1995 (based on final 1995 data). The State accounted for nearly 1.5% of the U.S. total nonfuel mineral production value.

More than 70% of Colorado's nonfuel mineral production value came from industrial minerals, especially construction sand and gravel, portland cement, and crushed stone, in descending order of value. Most of the State's remaining nonfuel mineral value resulted from the production of molybdenum, gold, and zinc. In 1996, large increases in the values of construction sand and gravel and portland cement and a relatively moderate increase in crushed stone were more than compensated for by a significant decrease in the value of molybdenum. A 46% decrease in molybdenum was the largest single decrease in nonfuel mineral value in 1996, resulting in the State's overall drop in value. Average to relatively low prices for molybdic oxide throughout the year caused this decrease in part. In 1996, other nonfuel minerals that increased in value included those of gold, lead, silver, Grade-A helium, and fire and bentonite clays. Other values that decreased in 1996 included those of zinc, industrial sand and gravel, crude gypsum, dimension stone, masonry cement, common clays, and lime.

Conversely, molybdenum accounted for the single largest increase in value from 1994 to 1995, rising by 144%. High prices paid for molybdic oxide early in the year contributed to this significant increase in 1995. In 1995, most commodities, especially those of construction sand and gravel, portland cement, and crushed stone, contributed to the year's increase in value. Only the values of common clays, lime, and gemstones showed small decreases that year.

Compared with USGS estimates of quantities produced in the other 49 States during 1996, Colorado remained fifth in lead and sixth in zinc; rose from eighth to seventh in construction sand and gravel; and dropped from first to third in molybdenum and from seventh to eighth in gold. In addition, substantial quantities of portland cement were produced in the State.

The following narrative information was provided by the Colorado Geological Survey[2] (CGS). The precious metals industry in Colorado set a modern era (post-World War II) production record in 1996 with approximately 7,650 kilograms of gold and 9,700 kilograms of silver. Production of metals will decline in 1997 because of the closure of the San Luis Mine and the Black Cloud Mine.

The Cresson Mine, which had total proven and probable reserves of 82 million metric tons[3] at a grade of 0.9 gram of gold per metric ton, began production in February 1995. The open pit mine produced approximately 5,400 kilograms gold and an estimated 780 kilograms of silver in 1996 and projected production of about 5,600 kilograms gold and 840 kilograms of silver in 1997 and succeeding years. About 275 people were employed at Cresson in 1996, and the same number was projected for 1997. Operating costs at the mine were about $200 per ounce of gold. Pikes Peak Mining Co., operator of the Cresson Mine, continued an aggressive precious metals exploration and development program in the Cripple Creek District, Teller County, and reported being successful, although no details were given.

The San Luis Gold Mine, Costilla County, reported having a productive year in 1996 producing approximately 2,100 kilograms of gold. Unfortunately, the mine was scheduled to close in the first quarter of 1997 because of ore exhaustion. About 100 jobs will be lost in an area of chronic underemployment, the San Luis Valley.

Base metal production, excluding molybdenum, was minor in Colorado. ASARCO Incorporated produced 800 tons per day of copper-lead-zinc-silver-gold ore from its Black Cloud Mine at Leadville, Lake County, through September. The company announced on October 23 that the mine would soon cease production and enter a maintenance status. Approximately 200 employees currently work at the mine and mill. Most of these jobs will be lost.

At the beginning of 1995, the free market price for molybdic oxide was $15.50 per pound. By yearend the price had fallen to about $4.50 per pound. During 1996, the price varied between $3 and $5 per pound. The Henderson Mine produced approximately 15,000 tons of molybdenum during 1996, down from 19,000 tons in 1995. Given stable economic conditions, the production forecast for 1997 is 15,000 tons. The Henderson Mine and mill employed 460 to 470 people.

The sand, gravel, and crushed stone industries had a productive 1996 in the Front Range metropolitan area from Colorado Springs to Fort Collins and in selected areas of western Colorado. The CGS expected production of aggregates in 1996 to be about 39 million tons, down slightly from 1995 levels. Decreased residential and commercial construction was expected to lead to a leveling off of sand, gravel, and crushed stone production in 1997 to about 36 million tons.

Colorado Diamond Co., a subsidiary of Redaurum Red Lakes Mines Ltd. of Toronto, announced a 270,000-ton-per-year trial mining program on their Kelsey Lake kimberlite prospect in the State line district of Larimer County. The Kelsey Lake Mine is North America's first commercial diamond producer since the turn of the century. Open pit mining at Kelsey Lake began in late 1995; however, the 160-metric-ton-per-hour diamond processing plant commenced operations in May 1996. The mine and processing plant will be upgraded to 900,000-ton-per-year production after the 2-year trial mining program. The company reported initial diamond-bearing kimberlite reserves of 16.9 million tons down to 100 meters depth.

During the summer of 1996, a 28.3-carat clear yellow gem-quality diamond was recovered from the Kelsey Lake kimberlite. Previous to this, a 14.2-carat gem-quality white diamond was unearthed during bulk sample testing in 1994. Redaurum expected the mine to produce about 25,000 carats of diamonds in 1996 and 100,000 carats in 1997. As of the end of the year, about 65% of the recovered diamonds were of gem quality.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

The USGS 1996 mineral production data published in this chapter were estimated as of December 1996. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] James A. Cappa, Chief, Minerals and Mineral Fuels, authored the text of the information provided by the Colorado Geological Survey.

[3] All tons are metric tons unless otherwise specified.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN COLORADO 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays	291	2,320	294	2,050 3/	324 3/	1,980 3/
Gemstones	NA	267	NA	245	NA	247
Gold 4/ kilograms	4,420	54,700	W	W	W	W
Sand and gravel (construction)	29,000	109,000	34,100	141,000	38,200	164,000
Stone:						
Crushed	8,260 5/	52,300 5/	9,000	58,500	9,800	64,700
Dimension metric tons	3,630 5/	51 5/	17,800	2,640	12,100	2,250
Combined value of cement, clays [fire clay (1996), kaolin (1995-96)], gypsum (crude), helium (Grade-A), lead, lime, molybdenum, peat, sand and gravel (industrial), silver, stone [crushed traprock and volcanic cinder (1994), dimension marble (1994)], zinc, and values indicated by symbol W	XX	192,000	XX	366,000	XX	295,000
Total	XX	410,000	XX	570,000	XX	528,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.
1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/ Data are rounded to three significant digits; may not add to totals shown.
3/ Excludes certain clays; value included with "Combined value" data.
4/ Recoverable content of ores, etc.
5/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
COLORADO: 1/ CRUSHED STONE 2/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 3/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	185	$1,040	$5.62
Filter stone	8	22	2.75
Other coarse aggregate	25	116	4.64
Coarse aggregate, graded:			
Concrete aggregate, coarse	566	3,890	6.87
Bituminous aggregate, coarse	800	4,510	5.64
Bituminous surface treatment aggregate	5	54	10.80
Railroad ballast	18	92	5.11
Fine aggregate (-3/8 inch): Stone sand, bituminous mix or seal 4/	608	3,110	5.12
Coarse and fine aggregates:			
Graded road base or subbase	556	2,560	4.60
Unpaved road surfacing	10	94	9.40
Terrazzo and exposed aggregate	48	540	11.30
Crusher run or fill or waste	418	1,120	2.68
Other construction materials 5/	52	290	5.58
Agricultural: Poultry grit and mineral food	(6/)	(6/)	16.50
Chemical and metallurgical: Cement manufacture 7/	1,190	6,470	5.44
Special:			
Asphalt fillers or extenders	(6/)	(6/)	19.80
Other specified uses not listed	(6/)	(6/)	3.70
Unspecified: 8/			
Actual	3,540	26,900	7.60
Estimated	751	4,680	6.23
Total	9,000	58,500	6.50

1/ To avoid disclosing company proprietary data; "District tables were not produced for 1995."

2/ Includes granite, limestone, miscellaneous stone, quartzite, sandstone, traprock, and volcanic cinder and scoria.

3/ Data are rounded to three significant digits; may not add to totals shown.

4/ Includes screening (undesignated).

5/ Includes drain fields.

6/ Withheld to avoid disclosing company proprietary data; included in "Total."

7/ Includes flux stone.

8/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
COLORADO: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994				1995			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	8	2,550	$13,900	$5.46	8	2,600	$15,300	$5.88
Granite	16 r/	5,110 r/	33,800 r/	6.62 r/	9	5,040	33,500	6.65
Sandstone	8 r/	603 r/	4,610 r/	7.65 r/	7	696	7,150	10.30
Traprock	(2/)	(2/)	(2/)	(2/)	1	W	W	3.54
Quartzite	--	--	--	--	1	W	W	5.80
Volcanic cinder and scoria	(2/)	(2/)	(2/)	(2/)	1	W	W	7.30
Miscellaneous stone	(3/)	(3/)	(3/)	(3/)	2	W	W	6.68
Total	XX	8,260 r/	52,300 r/	6.33 r/	XX	9,000	58,500	6.50

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Excludes traprock and volcanic cinder and scoria from State total to avoid disclosing company proprietary data.

3/ Revised to zero.

TABLE 4
COLORADO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	4,810	$23,600	$4.91
Plaster and gunite sands	71	506	7.13
Concrete products (blocks, bricks, pipe, decorative, etc.)	292	2,910	9.97
Asphaltic concrete aggregates and other bituminous mixtures	2,290	11,100	4.83
Road base and coverings 2/	5,860	21,300	3.63
Fill	1,460	3,820	2.62
Snow and ice control	151	820	5.43
Other 3/	2,490	8,920	3.58
Unspecified: 4/			
Actual	10,800	39,900	3.69
Estimated	5,870	27,700	4.71
Total or average	34,100	141,000	4.12

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Includes railroad ballast.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
COLORADO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	649	4,380	690	2,490	63	201	2,630	14,600	953	4,430	188	922
Asphaltic concrete aggregates and road base materials 3/	3,460	14,700	1,900	6,430	497	1,380	1,900	6,840	879	2,860	1,130	4,810
Other miscellaneous uses 4/	9	50	2,300	8,080	--	--	16	53	126	570	44 6/	168 6/
Unspecified: 5/												
Actual	2,330	8,900	3,690	12,800	192	733	3,430	13,000	1,180	4,570	--	--
Estimated	668	3,700	667	2,610	168	355	2,470	12,800	999	4,130	905	4,070
Total	7,110	31,700	9,250	32,400	919	2,670	10,400	47,300	4,140	16,600	2,260 6/	9,970 6/

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

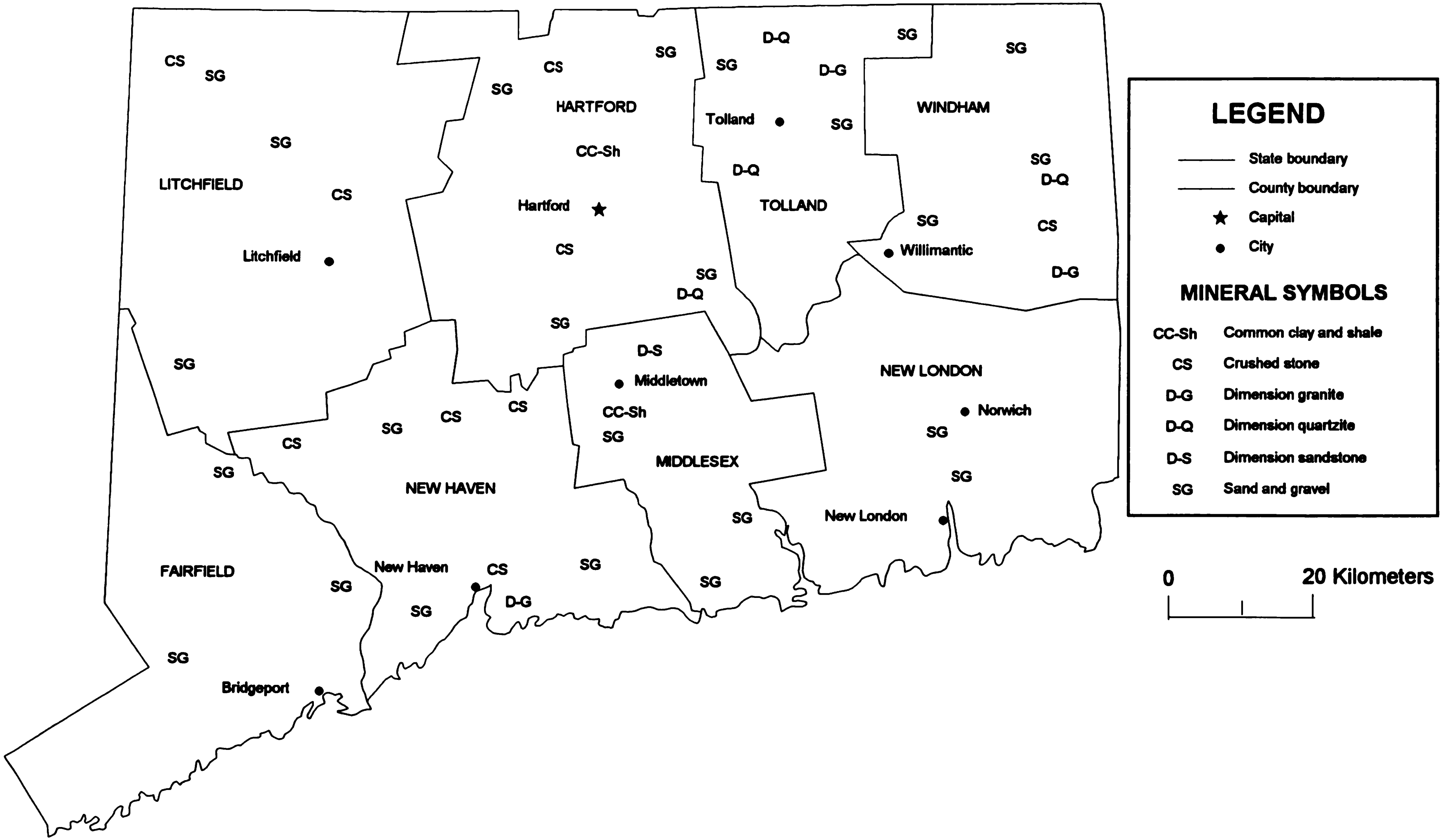
3/ Include fill, road and other stabilization (cement), and snow and ice control.

4/ Includes railroad ballast.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

6/ Includes unspecified within all districts.

CONNECTICUT



Source: Connecticut Geological and Natural History Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF CONNECTICUT

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Connecticut Geological and Natural History Survey for collecting information on all nonfuel minerals.

In 1996, for the fifth consecutive year, Connecticut was 44th among the 50 States in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $103 million, an 11% increase from that of 1995. This followed a nearly 13% increase from 1994 to 1995 (based on final 1995 data). The State accounted for somewhat less than 0.5% of the U.S. total nonfuel mineral production value. Crushed stone and construction sand and gravel, the leading mineral commodities accounted for nearly all of the State's total nonfuel mineral production value. Dimension stone, common clays, and gemstones were also produced in the State. Compared with 1995, the value of construction sand and gravel and crushed stone increased. The value of common clays decreased slightly.

The remaining narrative information was provided by the Connecticut Geological and Natural History Survey.[2] Under PA 96-145 persons removing sand, gravel, or other materials lying below the mean high watermark from State lands for beneficial or commercial use under permit will be charged a fee of $2 per cubic yard of material removed.

Controversy continued in Connecticut between those wanting to quarry sand and gravel or stone and residents near any proposed quarry. Except where the State's environmental laws are concerned, mining is regulated by the local town, making it much easier for local residents to protest nearby mining. In many towns, a mining permit must be renewed every 2 years. This involves getting approval from both the Inland Wetlands and Planning and Zoning Commissions and sometimes the Conservation Commission. Residents have an opportunity to speak for or against the renewals at each meeting.

Difficulties arose for a number of permit renewals. Fairfield Resources Inc. encountered opposition to the renewal of its stone quarry permit in the town of Brookfield. Residents have complained for years about drilling and blasting noise. In New Milford, the permit for a sand and gravel quarry owned by Squash Hollow Associates was renewed, but with several restrictions, including one requiring restoration of half of the worked area before any more quarrying could occur.

Proposed new quarries received even more opposition. A proposal to remove 300,000 or more cubic meters of clay where a pond now exists met with widespread neighborhood opposition in Hamden. The town Conservation Commission eventually rejected the plan, although the proposal could be resubmitted.

A proposed sand and gravel quarry on a farm in Canterbury was approved by the Planning and Zoning Commission despite opposition from residents. Area residents followed the approval with an appeal that will be heard by the State Supreme Court.

An expanded sand and gravel operation in Griswold was being opposed by residents who complain of dust, truck traffic, and noise. The site had been a small sand and gravel quarry for a number of years, but the owner recently leased it to the Mashantucket Pequot Tribe. The Mashantuckets expanded the operation from 0.6 to 11 hectares and started crushing stone. The residents claim the original permit did not allow the crushing or the expansion. The Tribe has attempted to prevent dust and agreed to stop crushing stone. They also plan to cease removing sand and gravel and have already laid off 89 workers.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity. All 1996 USGS mineral production data in this publication are estimates, as of March 1997.

Construction sand and gravel and crushed stone estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document No. 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Nancy McHone, Environmental Analyst, authored the text submitted by the Connecticut Geological Survey.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN CONNECTICUT 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones	NA	5	NA	5	NA	5
Sand and gravel (construction)	5,420	28,000	6,410	37,500	7,190	43,100
Stone (crushed)	5,710	43,900 3/	6,070 3/	45,500 3/	6,000 3/	50,400 3/
Combined value of other industrial minerals	XX	9,810	XX	9,470	XX	9,420
Total	XX	81,800	XX	92,500	XX	103,000

p/ Preliminary. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
CONNECTICUT: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse and fine aggregates: Graded road base or subbase 3/	121	$734	$6.07
Agricultural 4/	(5/)	(5/)	16.00
Unspecified: 6/			
Actual	(5/)	(5/)	7.51
Estimated	4,170	31,700	7.60
Total	6,070	45,500	7.50

1/ Includes granite, limestone, and traprock; excludes dolomite and quartzite from State total to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes bituminous aggregate (coarse), concrete aggregate (coarse), crusher run or fill or waste, other coarse aggregate, other coarse and fine aggregates, other graded coarse aggregate, riprap and jetty stone, screening (undesignated), and unpaved road surfacing.

4/ Includes agricultural limestone and poultry grit and mineral food.

5/ Withheld to avoid disclosing company proprietary data; included in "Total."

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
CONNECTICUT: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994				1995			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	5	1,440	W	W	6	W	W	W
Dolomite	1	408	(2/)	(2/)	(3/)	(3/)	(3/)	(3/)
Granite	3	119	$1,350	$11.30	6	172	1,530	$8.88
Traprock	8	3,750	30,100	8.04	9	4,500	W	W
Quartzite	--	--	--	--	(3/)	(3/)	(3/)	(3/)
Total	XX	5,710	43,900 r/	7.68 r/	XX	6,070	45,500	7.50

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Excludes dolomite value from State total to avoid disclosing company proprietary data.

3/ Excludes dolomite and quartzite from State total to avoid disclosing company proprietary data.

TABLE 4
CONNECTICUT: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

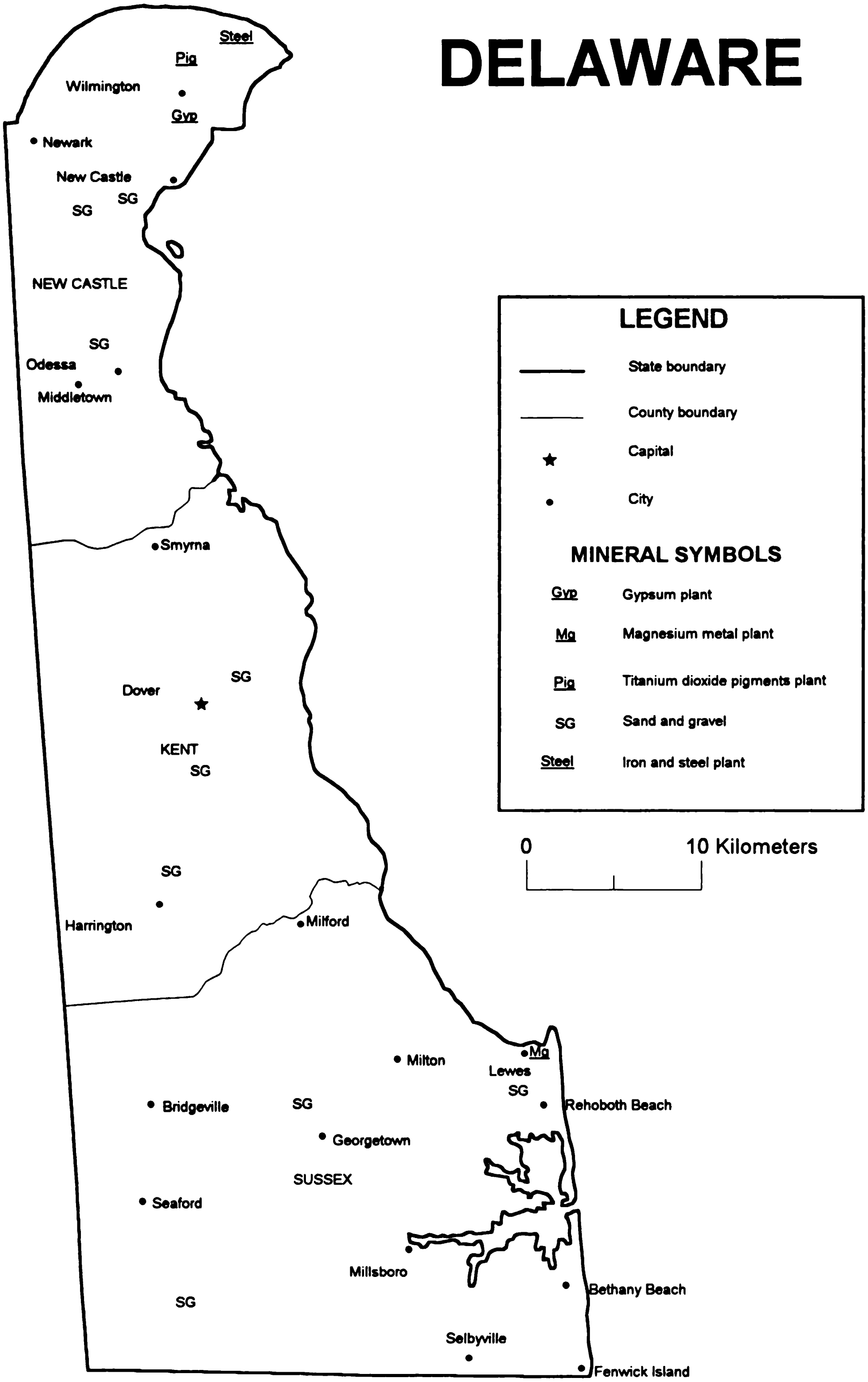
Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate and concrete products 2/	750	$4,200	$5.59
Asphaltic concrete aggregates and other bituminous mixtures	310	1,090	3.50
Road base and coverings 3/	526	2,430	4.61
Fill	578	2,340	4.06
Snow and ice control	204	1,010	4.97
Unspecified: 4/			
Actual	722	2,310	3.20
Estimated	3,320	24,100	7.26
Total or average	6,410	37,500	5.85

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement).

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.



Source: Delaware Geological Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF DELAWARE

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey, and the Delaware Geological Survey for collecting information on all nonfuel minerals.

Delaware remained 50th in the Nation in total nonfuel mineral production value[1] in 1996, according to the U.S. Geological Survey (USGS). Only construction sand and gravel and gemstones were mined in the State, as reported to the USGS. Delaware ranked fifth of the six States that produce magnesium compounds in the United States. Magnesium compounds were extracted from seawater close to the mouth of the Delaware Bay, near Lewes, Sussex County, for use in the manufacture of chemical and pharmaceutical products. Additionally, raw steel was produced in the State but was processed from materials acquired from other domestic and foreign sources.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN DELAWARE 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

	1994		1995		1996 p/	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones	NA	$1	NA	$1	NA	$1
Sand and gravel (construction)	2,580	8,680	2,680	8,740	3,100	10,700
Total 3/	XX	8,680	XX	8,750	XX	10,700

p/ Preliminary. NA Not available. XX Not applicable.
1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/ Data are rounded to three significant digits; may not add to totals shown.
3/ Partial total, excludes values which must be concealed to avoid disclosing company proprietary data.

TABLE 2
DELAWARE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED
IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Fill	W	W	$2.85
Unspecified: 2/			
Actual	W	W	2.49
Estimated	1,580	$5,630	3.57
Total or average	2,680	8,740	3.26

W Withheld to avoid disclosing company proprietary data; included in "Total."
1/ Data are rounded to three significant digits.
2/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

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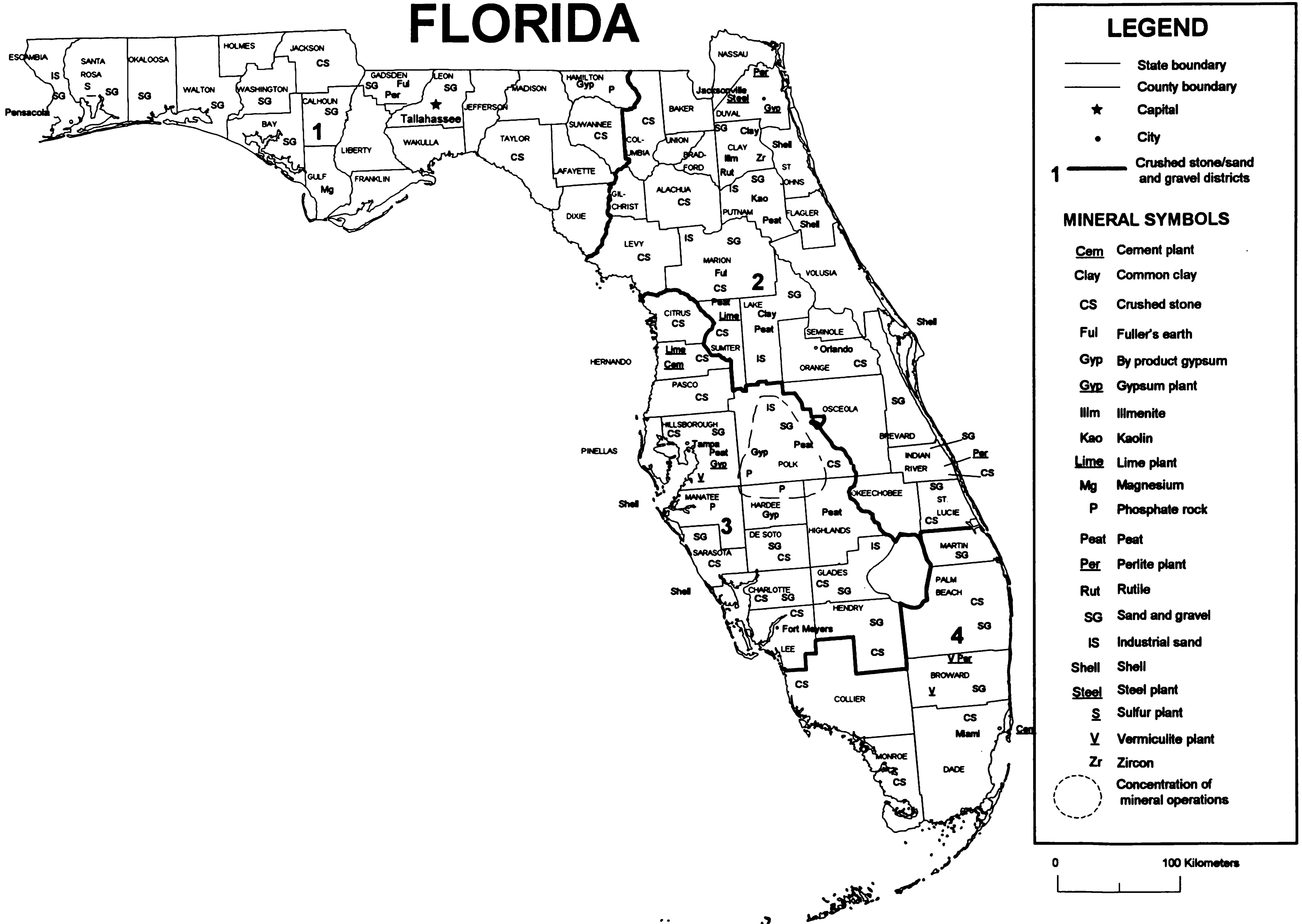
[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. Construction sand and gravel estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: http://minerals.er.usgs.gov/minerals/contacts/comdir.html

FLORIDA



Source: Florida Geological Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF FLORIDA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Florida Geological Survey for collecting information on all nonfuel minerals.

Florida ranked eighth among the 50 States in total nonfuel mineral production value[1] in 1996, according to the U.S. Geological Survey (USGS). This is a decline from seventh place in 1995. The estimated value for 1996 was more than $1.5 billion; though slightly up from 1995, the value was virtually unchanged. This followed a more than 12% increase in 1995 from 1994 (based on final 1995 data). The State accounted for about 4% of the U.S. total nonfuel mineral production value.

Florida continued to be the Nation's leading phosphate rock-mining State in 1995, producing more than six times the quantity of material as that of the next-highest State. Phosphate rock is only produced in four States. The phosphate rock industry usually has the most impact on the State's raw nonfuel mineral economy. Other mineral commodities that commonly have a significant effect on Florida's overall nonfuel mineral production value are crushed stone and portland cement. In 1996, most of the State's nonfuel mineral commodities increased in value. Their combined total increase slightly more than equaled an 8.4% decrease in phosphate rock value. Only phosphate rock decreased in value. Compared with 1995, increases in zircon concentrate, crushed stone, and construction sand and gravel values accounted for 81% of nonfuel mineral commodity value gains for 1996. Other values that increased in 1996 were those for portland cement, fuller's earth clays, titanium concentrates (both ilmenite and rutile), masonry cement, magnesium compounds, industrial sand and gravel, peat, staurolite, and kaolin clays. This followed a strong year in 1995 for the Florida mining industry when, similarly, nearly all mineral commodities increased in value. Phosphate rock then lead the way with a 17.5% increase over the 1994 value. Moderate increases occurred in construction sand and gravel, titanium concentrates, crushed stone, portland cement, and magnesium compounds in 1995.

Overall in 1996, Florida's mining industry maintained its rebound in nonfuel mineral production value which had begun in 1994. Since reaching the State's second alltime high of $1.61 billion in 1989, the State's mineral value had been on a downward trend. This culminated in the 9% drop to $1.31 billion from 1992 to 1993; declining phosphate rock value was the principal contributor. Most other mineral commodities in 1993 increased. In 1994, the increased values of phosphate rock, crushed stone, and portland and masonry cements were principally responsible for the year's turnaround in mineral value.

Florida, almost exclusively an industrial-mineral-producing State, remained first in the quantity of peat produced, second in fuller's earth and magnesium compounds, third in crushed stone, and seventh in portland cement (all 1996 rankings are based on USGS-estimated data). The State climbed from third to first in the production of masonry cement, and Florida was the only State to produce zircon concentrates, staurolite, and ilmenite and rutile concentrates (titanium ores). Additionally, Florida mining pits produced significant quantities of construction sand and gravel.

The following narrative information was provided by the Florida Geological Survey[2] (FGS). The Florida Legislature passed a statute in 1996 that enabled the FGS to compile and hold (protect) proprietary data pertaining to Florida's mineral operations. This will allow the FGS to more fully participate with the USGS in its mineral industry information program.

The phosphate industry was dominated by IMC-Agrico Co. having mines and processing plants located in Hardee, Hillsborough, Manatee, and Polk Counties. Other companies engaged in phosphate mining in the State in 1996 included: Cargill Fertilizer, Inc. operations in Hardee and Polk Counties; C.F. Mining Corp., Hardee County; NU-Gulf, Inc., Manatee County; and PCS Phosphate Co., Hamilton County. PCS Phosphate's Hamilton County operation was formerly the White Springs operation of Occidental Chemical Agricultural Products Inc.

The Florida Limerock and Aggregates Institute (FLAI) represents a number of limestone operators in Florida. The Institute is an autonomous division of the Florida Concrete Products Association, with which it merged several years ago. The primary focus of the FLAI is to pursue promotional, technical, and regulatory matters of concern to the aggregates industry. The Florida aggregates industry is working closely with the Florida Department of Transportation (FDOT) to address technical issues, especially the quality of source materials and the end uses of those materials. The two organizations are working together to improve the effectiveness of the quality assurance program used to control aggregate quality in the State. Of late, one of their primary concerns has been the use of recycled asphalt pavement as an aggregate component of hot-asphalt mix. FDOT focused on improving the performance of asphalt pavements.

A second important issue for the limestone industry product passing through multiple terminals, may serve to introduce more degradation of the physical characteristics of the aggregate product.

E. I. du Pont de Nemours & Co. Inc. planned to mine heavy minerals along the eastern edge of the Okefenokee Swamp. But the mining will occur over the border in Georgia and therefore, theoretically at least, should not directly affect Florida.

There were 10 peat mines in Florida. One of those, Stover Peat Co. near Tampa, was idle. The company currently has no plans to resume mining.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities, e.g., construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Steven Spencer, Coastal/Economic Geologist, authored the text submitted by the Florida Geological Survey.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN FLORIDA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	400	34,600	383	35,200	418	38,300
Portland	3,370	228,000	3,170	233,000	3,210	236,000
Clays 3/	430	55,000	421	54,300	433	55,900
Gemstones	NA	W	NA	W	NA	1
Peat	206	3,230	294 4/	5,390 4/	288 4/	6,200 4/
Sand and gravel:						
Construction	16,600	60,700	19,300	69,300	20,500	76,700
Industrial	540	6,120	547	6,340	535	6,590
Stone (crushed)	66,300 5/	343,000	68,000	350,000	70,000	368,000
Combined value of clays (common), magnesium compounds, phosphate rock, rare-earth metal concentrates (1994), staurolite, titanium concentrates (ilmenite and rutile), zircon concentrates, and values indicated by symbol W	XX	669,000	XX	783,000	XX	749,000
Total	XX	1,400,000	XX	1,540,000	XX	1,540,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value" data.

4/ Data series changed to production beginning in 1995, prior years shipment data may not be comparable.

5/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
FLORIDA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	96	$591	$6.16
Filter stone	11	120	10.90
Coarse aggregate, graded:			
Concrete aggregate, coarse	7,740	58,000	7.49
Bituminous aggregate, coarse	2,480	13,300	5.36
Bituminous surface-treatment aggregate	W	W	10.50
Railroad ballast	W	W	4.18
Other graded coarse aggregate	793	4,830	6.09
Fine aggregate (-3/8 inch):			
Stone sand, concrete	1,980	10,500	5.30
Stone sand, bituminous mix or seal	W	W	4.73
Screening, undesignated	2,770	13,100	4.73
Other fine aggregates	1,120	6,190	5.53
Coarse and fine aggregates:			
Graded road base or subbase	12,900	40,700	3.16
Unpaved road surfacing	243	1,190	4.90
Crusher run or fill or waste	5,670	15,100	2.66
Other coarse and fine aggregates	W	W	3.09
Other construction materials 3/	1,950	8,700	4.46
Agricultural:			
Agricultural limestone	406	3,200	7.88
Poultry grit and mineral food	199	2,190	11.00
Other agricultural uses	194	1,030	5.31
Chemical and metallurgical:			
Cement manufacture	(4/)	(4/)	1.40
Chemical stone	15	209	13.90
Glass manufacture	118	1,560	13.20
Special: Asphalt fillers or extenders	246	2,040	8.29
Other specified uses not listed	(4/)	(4/)	7.80
Unspecified: 5/			
Actual	21,800	138,000	6.33
Estimated	5,610	26,500	4.72
Total	68,000	350,000	5.14

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Includes calcareous marl, dolomite, granite, limestone, limestone-dolomite, and shell.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes drain fields.

4/ Withheld to avoid disclosing company proprietary data; included in "Total."

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
FLORIDA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994				1995			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	80 r/	64,000 r/	$329,000 r/	$5.14	74	64,700	$333,000	$5.15
Dolomite	4 r/	1,160	W	W	4	1,120	7,010	6.28
Shell	6	1,160	4,530	3.92	5	1,090	4,100	3.78
Calcareous marl	1 r/	(3/)	W	W	2	W	W	4.53
Granite	--	--	--	--	3	W	W	5.26
Total	XX	66,300 r/	343,000	5.18 r/	XX	68,000	350,000	5.14

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes "Limestone-dolomite," reported with no distinction between the two.

3/ Excludes calcareous marl quantity from State total to avoid disclosing company proprietary data.

TABLE 4
FLORIDA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	--	--	70	525	37	186
Coarse aggregate, graded 4/	--	--	7,040	56,700	4,120	20,200
Fine aggregate (-3/8 inch) 5/	--	--	4,060	21,400	2,960	13,900
Coarse and fine aggregate 6/	68	474	9,450	32,000	9,590	25,400
Other construction materials 7/	(8/)	(8/)	(8/)	(8/)	--	--
Agricultural 9/	(8/)	(8/)	(8/)	(8/)	--	--
Chemical and metallurgical 10/	--	--	(8/)	(8/)	--	--
Special 11/	--	--	246	2,040	--	--
Other miscellaneous uses 12/	--	--	(8/)	(8/)	--	--
Unspecified: 13/						
Actual	833	3,230	2,990	16,500	18,000	118,000
Estimated	1,100	5,310	1,970	9,550	2,540	11,600
Total	2,200	10,700	28,600	150,000	37,200	189,000

1/ Production reported in District 2 was included with "District 3" to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone and riprap and jetty stone.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

7/ Includes drain fields.

8/ Withheld to avoid disclosing company proprietary data; included in "Total."

9/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

10/ Includes cement manufacture, chemical stone for alkali works, and glass manufacture.

11/ Includes asphalt fillers or extenders.

12/ Includes other specified uses not listed.

13/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	6,110	$24,900	$4.08
Plaster and gunite sands	359	1,460	4.05
Concrete products (blocks, bricks, pipe, decorative, etc.)	479	2,240	4.68
Asphaltic concrete aggregates and road base materials 2/	3,120	6,500	2.08
Other 3/	788	3,830	4.86
Unspecified: 4/			
Actual	3,320	13,500	4.06
Estimated	5,170	16,900	3.26
Total or average	19,300	69,300	3.58

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes fill, road and other stabilization (cement and lime).

3/ Includes filtration.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	W	W	W	W	1,350	5,710	--	--
Asphaltic concrete aggregates and road base materials 3/	W	W	W	W	1,610	3,760	867	1,520
Other miscellaneous uses 4/	1,540	3,910	4,790	20,600	696	3,390	--	--
Unspecified: 5/								
Actual	229	2,110	1,120	4,770	1,690	6,140	283	480
Estimated	2,060	7,070	2,110	6,710	889	2,700	119	408
Total	3,820	13,100	8,020	32,100	6,240	21,700	1,270	2,410

W Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses."

1/ Data are rounded to three significant digits; may not add to totals shown.

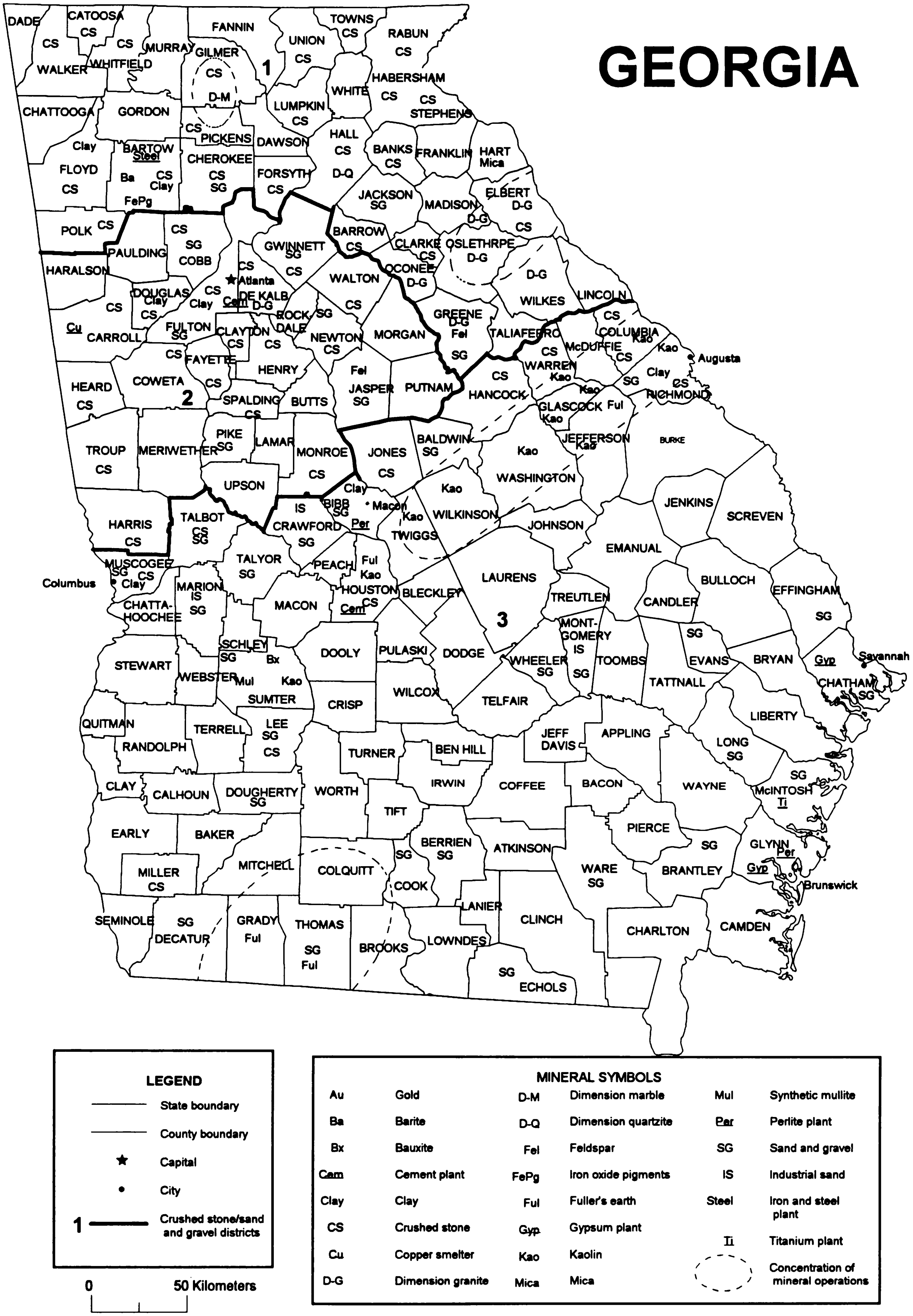
2/ Includes plaster and gunite sands.

3/ Includes fill, road and other stabilization (cement and lime).

4/ Includes filtration.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

GEORGIA



MINERAL SYMBOLS

Au	Gold	D-M	Dimension marble	Mul	Synthetic mullite
Ba	Barite	D-Q	Dimension quartzite	Per	Perlite plant
Bx	Bauxite	Fel	Feldspar	SG	Sand and gravel
Cem	Cement plant	FePg	Iron oxide pigments	IS	Industrial sand
Clay	Clay	Ful	Fuller's earth	Steel	Iron and steel plant
CS	Crushed stone	Gyp	Gypsum plant		
Cu	Copper smelter	Kao	Kaolin	Ti	Titanium plant
D-G	Dimension granite	Mica	Mica		Concentration of mineral operations

Source: Georgia Geologic Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF GEORGIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Georgia Geologic Survey for collecting information on all nonfuel minerals.

Georgia decreased in rank from fifth to sixth nationally in total nonfuel mineral production value[1] in 1996, according to the U.S. Geological Survey (USGS). The estimated value was more than $1.7 billion, representing a more than 1% increase from the value of 1995. This followed a 9.7% increase in value in 1995 from that of 1994 (based on final 1995 data). The State accounted for about 4.5% of the U.S. total nonfuel mineral production value.

Georgia was by far the leading clay-producing State in the Nation, accounting for nearly 25% of U.S. total clay production. The State's clays included those of kaolin, common, and fuller's earth. Kaolin remained Georgia's foremost nonfuel mineral commodity in 1996, accounting for nearly 61% of the State's estimated total nonfuel mineral value and, of that, about 92% of its clay value. In 1996, kaolin production and value dropped off about 1%, after having risen about 10% the previous year. Crushed stone, which accounts for more than 23% of the State's nonfuel mineral value, provided the largest portion of the State's increase in 1996, rising 14% in value from that of 1995. Compared with 1995, other mineral commodities that increased in value were portland cement, construction sand and gravel, masonry cement, barite, feldspar, iron oxide pigments, and gemstones. Decreases occurred in kaolin, dimension stone, fuller's earth, common clays, and crude mica.

Based on USGS estimates of the quantities of minerals produced in the United States during 1995, Georgia remained first among the 50 States in fuller's earth; second in dimension stone and barite; third in iron oxide pigments and third of five crude mica-producing States; fifth in common clays and feldspar; and ninth in masonry cement. While Georgia rose from seventh to sixth in crushed stone, significant quantities of portland cement and industrial sand and gravel continued to be produced in the State.

The following narrative information was provided by the Georgia Geologic Survey[2] (GGS), in cooperation with representatives of the Georgia Mining Association, the Georgia Crushed Stone Association, and the Eberton Granite Association. According to the GGS, the economic boom created by the Centennial Olympic Games had a significant impact on Georgia's mining industry in 1996. The Olympics spurred growth for the construction industry which in turn increased sales of aggregate products such as sand, gravel and crushed stone. These products were used extensively in residential, commercial, and industrial building construction. They were also used in community, State, and federal construction projects such as roads, highways, dams, railroad beds, bridges, airports, tunnels, and water systems.

Employment was stable throughout the mining industry and the average annual pay of mining workers continued to rise. According to a U.S. Department of Labor report, Georgia's mining industry had the highest average annual pay of any private employment sector in the State at $38,172. This represented a 5.2% increase from that of 1994. The mining industry employed more than 8,500 people in the State.

According to the sources above, the general economic outlook for the mining industry for 1997 was projected to be very stable. Companies mining feldspar and marble were predicting a slight increase in sales and capital investments. Although the kaolin industry could have a small decline in sales, employment throughout the mining industry was anticipated to remain steady.

Some of the major legislative and policy issues of interest to the industry in 1996 included matters entailed with environmental regulation, legal, regulatory, and tax reform, and a variety of land use amendments. Protecting the industry with an effective government program was a key objective of the GMA. One of the big legislative questions that will face the General Assembly in 1997 is an expected reduction in revenue of some $500 million, a result of Governor Miller's rollback of the sales tax on groceries. Deregulation will be a hot legislative issue for the mining industry in 1997. Lawmakers will involve themselves further in the deregulation of energy production such as natural gas, in an effort to transition in a "reasonable way" to a competitive market arena.

Kaolin was mined and processed in “Middle” (east-central) Georgia, especially between Macon and Augusta. It recently became the largest volume commodity handled by the port of Savannah due to increasing demand for kaolin in the foreign markets of Europe, Indonesia, Japan, and South Korea. U.S. producers of paper and paint use large volumes of kaolin to manufacture their products. With more than 4,400 Georgians employed in the mining and processing of kaolin, it is the State's most important mineral product.

In 1996, shipments of crushed stone totaled an estimated 64 million metric tons[3] compared to the previous record high shipments of 61 million tons in 1995. Much of this production was due to the 1996 Olympics and some decrease was thought possible for 1997. However, some other construction projects that had been delayed because of the Olympics were expected to go forward and 1997 highway spending was expected to be higher than in 1996. Highway construction accounted for about one-third of crushed stone sales.

Georgia's dimension granite industry includes Elbert, Oglethorpe, Madison, Greene, and Wilkes Counties; however, most quarries and plants are in Elbert County. As of yearend 1996, there were 40 active quarries with 365 production workers. The total payroll was $6.8 million in 1995-96. Production in 1996 was steady with little change in volume as local markets remained stable or better. However, sales to historically favorable markets, such as Japan and South Korea, showed significant declines in 1996 due to increasing competition from Chinese producers who ship finished products that undercut U.S. finishers. This decline has been somewhat offset by increased sales to Canada, but this is not a large market at present.

A coalition of Georgian and other American dimension stone producers petitioned the U.S. Customs Office to modify the classification of imported stone products in order to separately identify memorial monuments and markers. The classification was approved. This will aid American companies in evaluating foreign competition because it will allow these products to be differentiated from other imported stone products.

There was increased interest in using water jet cutting in quarrying. Several companies were leasing this cutting equipment; however, it still made up less than one-third of the cutting equipment used in the industry. The manufacturing and finishing side of the industry remainedstrong and was primarily focused on monument production. Considerable investment has been made in automated diamond sawing and polishing equipment. Activity in the curbstone market remained steady with large quantities of substandard monument stone sold for curbing in New England.

Two major problems in the dimension granite industry centered around the issues of rural development encroachment and the shortage of skilled labor. Cremation has not had a major impact on the dimension stone market. However, there was little prospect for major long-term growth because of little market diversification outside the traditional monument and cemetery stone markets.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities, e.g., construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: http://minerals.er.usgs.gov/minerals/contacts/comdir.html .

[2] Bruce J. O'Connor, Supervisory Geologist, authored the text submitted by the Georgia Geologic Survey

[3] All tons are metric tons unless otherwise specified.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN GEORGIA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays	9,960 3/	1,060.000 3/	10,600	1,160.000	10,500	1,140,000
Gemstones	NA	51	NA	51	NA	W
Sand and gravel:						
Construction	5,520	19,800	5,780	23,100	6,460	27,100
Industrial	440	7040	574	7,060	574	7,060
Stone:						
Crushed	54,600	331,000	60,600	373,000	63,800	399,000
Dimension metric tons	200,000 4/	19,100 4/	132,000	27,700	153,000	27,200
Combined value of barite, bauxite (1994-95), cement, clays [fire (1994)], feldspar, iron oxide pigments (crude), mica (scrap), and stone [dimension marble and miscellaneous (1994)], and value indicated by symbol W	XX	115,000	XX	109,000	XX	118,000
Total	XX	1,550,000	XX	1,700,000	XX	1,720,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value" data.

4/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
GEORGIA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit Value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	780	$6,970	$8.94
Filter stone	321	2,380	7.42
Other coarse aggregate	W	W	8.22
Coarse aggregate, graded:			
Concrete aggregate, coarse	7,530	45,900	6.10
Bituminous aggregate, coarse	9,190	59,000	6.43
Bituminous surface-treatment aggregate	W	W	5.09
Railroad ballast	1,520	6,300	4.15
Other graded coarse aggregate	W	W	6.92
Fine aggregate (-3/8 inch):			
Stone sand, concrete	1,740	10,400	6.01
Stone sand, bituminous mix or seal	1,710	8,590	5.01
Screening, undesignated	1,120	6,320	5.65
Other fine aggregate	W	W	3.89
Coarse and fine aggregates:			
Graded road base or subbase	4,200	21,400	5.10
Unpaved road surfacing	W	W	5.18
Terrazzo and exposed aggregate	W	W	6.08
Crusher run or fill or waste	6,030	30,200	5.02
Other construction materials	4,680	29,500	6.31
Chemical and metallurgical:			
Cement manufacture	(3/)	(3/)	(3/)
Lime manufacture	(3/)	(3/)	(3/)
Special: Other fillers or extenders	(3/)	(3/)	(3/)
Unspecified: 4/			
Actual	19,800	133,000	6.72
Estimated	1,090	6,940	6.39
Total	60,600	373,000	6.14

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Includes calcareous marl, granite, limestone, limestone-dolomite, marble, and quartzite.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
GEORGIA: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	11	5,090	$31,000	$6.09	16	7,360	$46,000	$6.25
Marble	8	W	W	7.29	7	W	W	6.84
Calcareous marl	1	W	W	4.20	1	W	W	3.91
Granite	50 r/	47,500 r/	289,000 r/	6.08	51	51,300	315,000	5.57
Quartzite	7 r/	W	W	6.00 r/	1	W	W	6.50
Total	XX	54,600	331,000	6.07	XX	60,600	373,000	6.14

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes "Limestone-dolomite," reported with no distinction between the two.

TABLE 4
GEORGIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 2/	W	W	690	5,960	W	W
Coarse aggregate, graded 3/	W	W	11,000	67,100	W	W
Fine aggregate (-3/8 inch) 4/	W	W	3,470	19,500	W	W
Coarse and fine aggregate 5/	3,030	16,800	(6/)	(6/)	W	W
Other construction materials	5,070	33,300	1,670	12,400	5,880	31,800
Chemical and metallurgical 7/	(6/)	(6/)	--	--	--	--
Special 8/	(6/)	(6/)	--	--	--	--
Unspecified: 9/						
Actual	(6/)	(6/)	(6/)	(6/)	7,520	50,400
Estimated	1,090	6,940	--	--	--	--
Total	18,700	121,000	28,500	169,000	13,400	82,200

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes filter stone, riprap and jetty stone, and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

5/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and crusher run (select material or fill).

6/ Withheld to avoid disclosing company proprietary data; included in "Total."

7/ Includes cement and lime manufacture.

8/ Includes other fillers or extenders.

9/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
GEORGIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	3,150	$13,200	$4.19
Plaster and gunite sands	440	1,610	3.65
Concrete products (blocks, bricks, pipe, decorative, etc.)	110	643	5.85
Asphaltic concrete aggregates and other bituminous mixtures	W	W	13.20
Fill	W	W	2.77
Snow and ice control	W	W	4.97
Other	194	891	4.59
Unspecified: 2/			
Actual	692	2,050	2.96
Estimated	1,190	4,740	3.97
Total or average	5,780	23,100	4.00

W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
GEORGIA: CONSTRUCTION SAND AND GRAVEL 1/ SOLD OR USED IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

Use	District 2		District 3	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 3/	498	2,820	3,200	12,600
Other miscellaneous uses 4/	60	236	134	655
Unspecified: 5/				
Actual	--	--	692	2,050
Estimated	232	998	962	3,740
Total	790	4,060	4,990	19,000

1/ Production reported in District 1 was included with "District 2" to avoid disclosing company proprietary data.

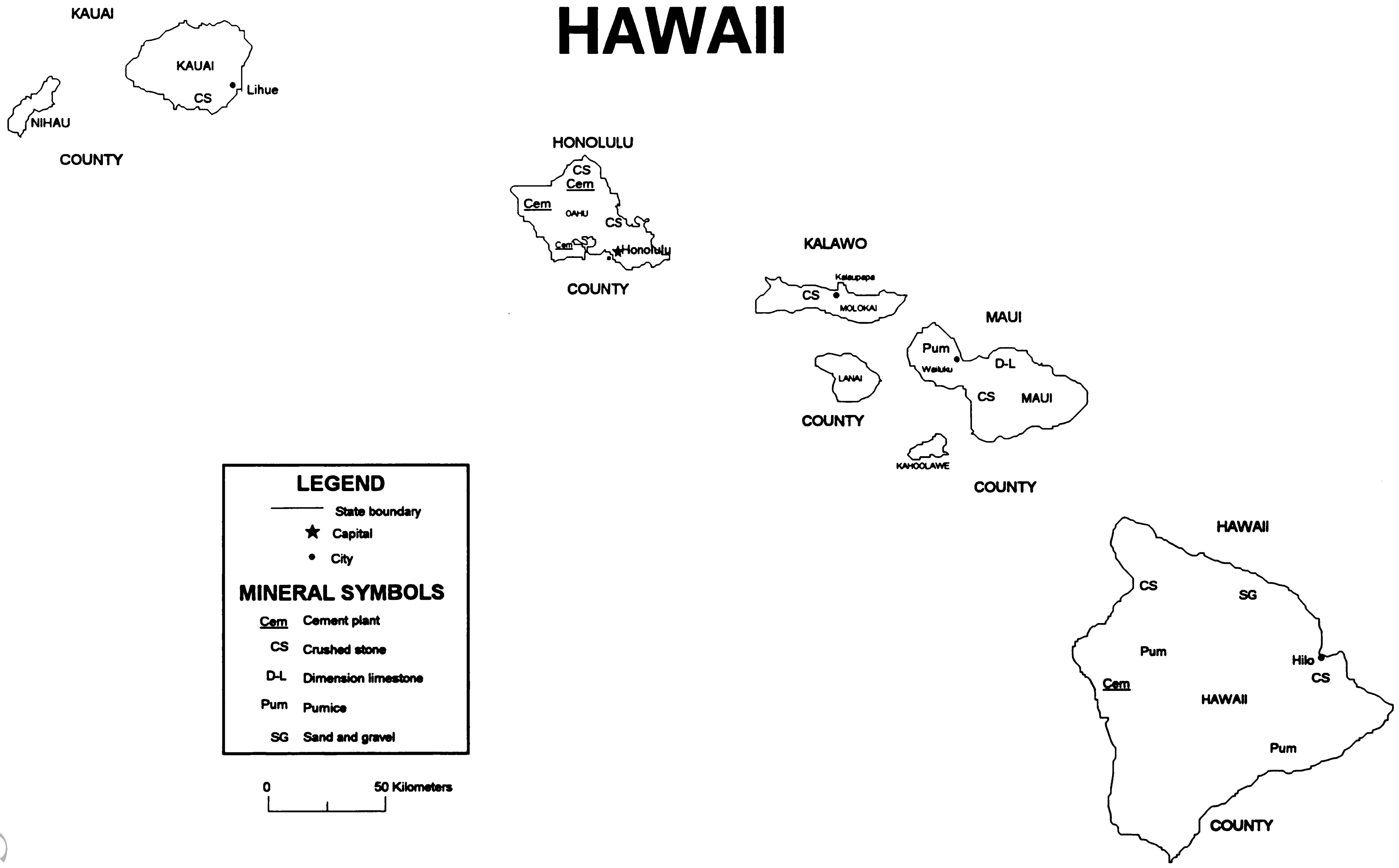
2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes plaster and gunite sands.

4/ Includes asphaltic concrete aggregates and other bituminous mixtures, fill, and snow and ice control.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

HAWAII



Source: Hawaii Division of Water and Land Development/U.S. Geological Survey

THE MINERAL INDUSTRY OF HAWAII

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Hawaii Division of Water and Land Development for collecting information on all nonfuel minerals.

Hawaii remained 43d among the 50 States in total nonfuel mineral production value[1] in 1996, according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $112 million, about a 2% decrease from that of 1995. This followed a 1.7% decrease from 1994 to 1995 (based on final 1995 data). The State accounted for a little less than one-half percent of the U.S. total nonfuel mineral production value.

Mining in Hawaii consisted mostly of the quarrying of stone to produce crushed stone and the extraction of sand and gravel from open pits, both for use by the Islands' construction industry. Most of the State's portland cement was produced at one manufacturing plant on the island of Oahu, Honolulu County. Hawaii's small decrease in the value of nonfuel mineral production in 1996 is mostly attributable to portland cement. While the value of crushed stone increased by 5% and construction sand and gravel edged up slightly, almost a 14% decrease in portland cement plus a small drop in masonry cement more than offset the increase. In 1995, except for the net decrease, the opposite was true. The decrease in crushed stone value was larger than the increase in portland cement. Both mineral commodities have shown an overall decrease in value since both reached a high in 1992. In 1992, 9.5 million metric tons of crushed stone were produced at an estimated value of $93.5 million and 520,000 tons of portland cement were produced at a value of almost $54 million.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. Construction sand and gravel, crushed stone, and portland cement estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: http://minerals.er.usgs.gov/minerals/contacts/comdir.html

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN HAWAII 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

	1994		1995		1996 p/	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	6	395	5	501	5	455
Portland	404	28,300	357	35,500	305	30,300
Sand and gravel (construction)	521	4,740	405	4,030	425	4,340
Stone (crushed)	8,170	82,300	7,450 3/	73,500 3/	7,800 3/	77,200 3/
Total 4/	XX	116,000	XX	114,000	XX	112,000

p/ Preliminary. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain stones; data excluded to avoid disclosing company proprietary data.

4/ Partial total, excludes values that must be concealed to avoid disclosing company proprietary data.

TABLE 2
HAWAII: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	7	$102	$14.60
Filter stone	30	265	8.83
Other coarse aggregate	269	3,070	11.40
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,310	18,000	13.70
Bituminous aggregate, coarse	192	1,920	10.00
Fine aggregate (-3/8 inch):			
Stone sand, concrete	532	8,080	15.20
Stone sand, bituminous mix or seal	153	1,560	10.20
Screening, undesignated	W	W	4.10
Other fine aggregate	W	W	11.80
Coarse and fine aggregates:			
Graded road base or subbase	692	6,990	10.10
Unpaved road surfacing	W	W	8.71
Terrazzo and exposed aggregate	W	W	10.00
Crusher run or fill or waste	1,130	6,120	5.42
Other construction materials 3/	328	2,110	6.43
Agricultural: Agricultural limestone	(4/)	(4/)	20.50
Chemical and metallurgical: Cement manufacture	(4/)	(4/)	8.30
Unspecified: 5/			
Actual	32	351	11.00
Estimated	2,430	22,000	9.05
Total	7,450	73,500	9.87

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Includes limestone, traprock, and volcanic cinder and scoria; excludes miscellaneous stone and sandstone from State total to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes pipe bedding and roofing granules.

4/ Withheld to avoid disclosing company proprietary data; included in "Total."

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
HAWAII: CRUSHED STONE SOLD OR USED, BY KIND 1/

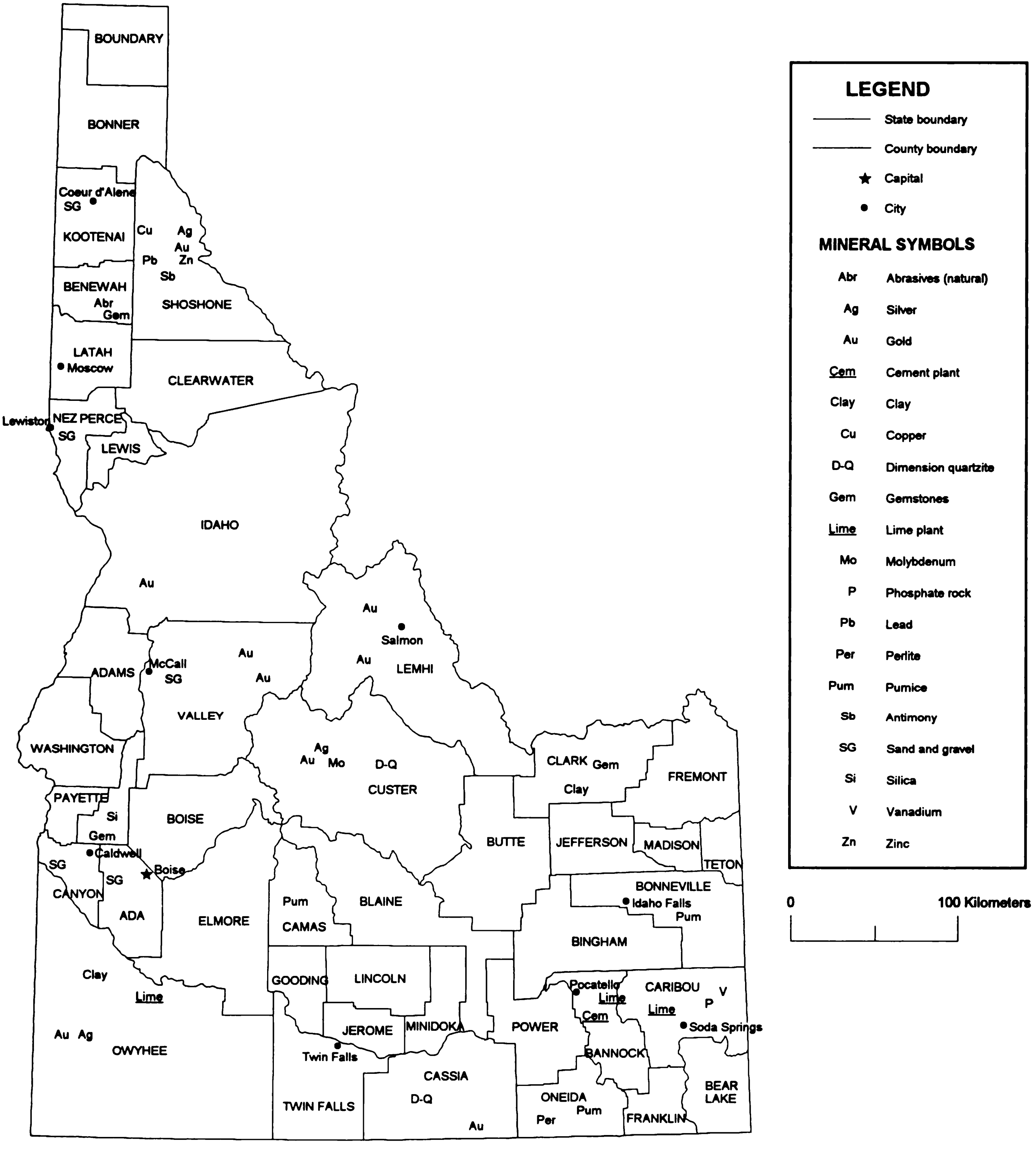
	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	7 r/	1,070 r/	$11,200 r/	$10.50	7	1,190	$10,300	$8.66
Sandstone	1	W	W	11.00	(2/)	(2/)	(2/)	(2/)
Traprock	21 r/	6,680 r/	66,800 r/	10.00 r/	22	6,230	63,100	10.10
Volcanic cinder and scoria	6 r/	74 r/	426 r/	5.76 r/	4	29	166	5.72
Miscellaneous stone	2 r/	W	W	11.00	(2/)	(2/)	(2/)	(2/)
Total	XX	8,170	82,300	10.10	XX	7,450	73,500	9.87

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Excludes miscellaneous stone and sandstone from State total to avoid disclosing company proprietary data.

IDAHO



Source: Idaho Geological Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF IDAHO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Idaho Geological Survey for collecting information on all nonfuel minerals.

Idaho ranked 32d among the 50 States in total nonfuel mineral production value[1] in 1996, according to the U.S. Geological Survey (USGS). The State was 26th in 1995. The estimated value for 1996 was $411 million, a 19% decrease from that of 1995. This followed a 24% increase from 1993 to 1994 and a 50% increase from 1994 to 1995 (based on revised final 1994 data and final 1995 data.) In 1996, the State accounted for more than 1% of the U.S. total nonfuel mineral production value.

Gold, by value, became the leading nonfuel mineral in Idaho in 1996; molybdenum was first in 1995 because of a significant increase in production from that of 1994 and higher market prices for the metal during the first half of the year. In 1996, most of Idaho's decrease in nonfuel mineral value was due to low molybdenum prices as compared to those of the first half of 1995 plus a small decrease in the metal's production. Industrial minerals, led by phosphate rock and construction sand and gravel, accounted for about 60% of the State's total nonfuel mineral production value. Of the remaining 40%, gold, molybdenum, silver, and lead, in descending order of value, were the leading metals.

The average price of molybdenum (contained in molybic oxide) increased from $4.60 per kilogram in 1994 to $17.50 per kilogram in 1995, and then declined to about $7.50 per kilogram in 1996. Consequently, this accounted for much of the decline in the State's value of mineral production between 1995 and 1996. Whereas value changes occurring for most other mineral commodities during 1996 were small relative to those of molybdenum, moderate increases in lead and gold (up $7 million) more than offset the lowered values of construction sand and gravel (down $5.8 million) and phosphate rock. In 1996, other nonfuel mineral values that increased were those of silver, lime, vanadium ore, dimension quartzite, zinc, antimony, natural gemstones, and masonry cement. Other nonfuel minerals that decreased in value included portland cement, crushed stone, garnet, copper, and pumice and pumicite.

Compared with USGS estimates of quantities produced in the other 49 States in 1996, Idaho remained the only State to produce vanadium ore and antimony, the second largest producer of two garnet-producing States, third in silver and lead, fourth in molybdenum and pumice, and sixth in gold. The State rose from third to second of four phosphate rock-producing States. Additionally, significant quantities of construction and industrial sand and gravel and lime were produced in the State.

The following narrative information was provided by the Idaho Geological Survey[2] (IGS). Production data in the following text are those reported by the IGS, based on its own surveys and estimates. They differ from some production figures reported to the USGS. Idaho set another new State record of 10,800 kilograms of gold poured last year. This surpasses the 1995 mark of 9,330 kilograms. The leading producer of Idaho's six major gold mines was Meridian Gold Inc.'s new Beartrack Mine in Lemhi County with 3,380 kilograms of gold recovered. The company changed its name from FMC Gold Co. after being spun off from FMC earlier in the year. Meridian did extensive drilling for new ore between the two pits. Pegasus Gold Corp.'s Black Pine Mine, which opened in 1991, poured 2,730 kilograms. The company continued mining the C/D pit and NE Tolman pit as it started planning for closure of its Cassia County operation in 1997. Hecla Mining Co.'s Grouse Creek Mine in Custer County recovered 2,370 kilograms of gold and 10,590 kilograms of silver. Hecla announced that it also will be shutting down in 1997 after mining of the Sunbeam pit is completed. Operations were shut down from May to July while the Grouse Creek tailings dam was raised 12 meters to hold the rest of the Sunbeam tailings. The Grouse Creek deposit, which has a high stripping ratio, will be left unmined. Kinross Gold Corp. was mining 1,370 kilograms of gold and 36,700 kilograms of silver from both the DeLamar Mine and the newly opened, adjacent Stone Cabin Mine in Owyhee County, respectively. Kinross added a Knelson Concentrator to its mill circuit. At Dakota Mining Corp.'s seasonal Stibnite Mine in Valley County, the original West End pit was mined out and new gold mining started at the Stibnite Pit. Dakota also had an extensive program of exploration and delineation drilling. Seasonal gold operations continued at United States Antimony Corp.'s Yellow Jacket Mine in Lemhi County and CSC Mining Co.'s Rescue Mine in Warren. Thompson Creek Mining Co. was at full production at the Thompson Creek molybdenum mine near Challis. The company added a shovel and loader and built a pyrite reduction plant to remove 80% of the pyrite from the mill tails before they go to impoundment.

The pace of mining and exploration work in the famous Coeur d'Alene District increased because of new discoveries, good lead prices, and moderate silver prices. According to the IGS, total silver production in the Valley increased from approximately 106 metric tons[3] in 1995 to 190 tons in 1996. Sunshine Mining and Refining Co. returned the Sunshine Mine to nearly full production, increasing output by 50% in 1996 to 80 tons of silver plus 1,160 tons of lead and 305 tons of copper. Development of the West Chance discovery was completed on the 940 meter and 1,100 meter levels. Hecla increased production of silver (60 tons in 1996) and lead (18,750 tons) at the Lucky Friday Mine. Hecla also had a major exploration project near the old Gold Hunter silver-lead mine, located 1,200 meters north of the Friday. Drilling from the new 1,500 meter level drift of the Friday intersected high silver grades along the Gold Hunter vein. Hecla continues to evaluate the new deposit. Silver Valley Resources Corp., a joint venture of ASARCO Incorporated and Coeur d'Alene Mines Corp., did development mining at the Coeur Mine, extracting about 50 tons of silver. They plan to reopen the Galena Mine in 1997.

May 26, 1996, marked the end of an era in the Silver Valley. The stacks of Bunker Hill Mine's smelter and zinc plant were razed. Built in 1976, the smelter stack was 218 meters tall and a local landmark. Environmental work in the Silver Valley continued, but was set back by early spring flooding. Over 1,000 residential lawns have already been replaced with new soil with about 600 remaining.

Phosphate is the largest mineral industry in the State. This includes both phosphate rock and processed elemental phosphorus. The four southeastern Idaho mines, FMC Corp.'s Dry Valley Mine, J. R. Simplot Co.'s Smokey Canyon Mine, Rhône-Poulenc Basic Chemical Co.'s Rasmussen Ridge Mine, and Monsanto Co.'s Enoch Valley Mine, extract more than 5.9 million tons of ore per year. Value of the ore and processing, conducted at Soda Springs and Pocatello, was estimated at over $660 million for 1995. This contributed to a total value of more than $1billion for Idaho's mineral production. Mines and plants, including Kerr-McGee Corp.'s vanadium extraction plant and Agrium Inc.'s fertilizer plant that processes ore mined by Rhône-Poulenc Basic Chemical Co., were operating at full capacity. A major footwall failure at Dry Valley destroyed a shovel, but there were no injuries. At least two companies did exploration drilling, and Federal Agencies continued writing the Environmental Impact Statements for two new proposed lease areas, Manning Creek and the Dairy Syncline. Rhône-Poulenc won the State's soft rock reclamation award for efforts at Rasmussen Ridge, and Monsanto Co. assisted the dwindling population of Western big-eared bats by building an artificial bat cave in a reclaimed portion of their mine.

Aggregate demand continued to be strong because of an active construction industry fueled by rapid growth, particularly in the urban areas. Ash Grove Cement West Inc. and dimension stone quarries also reported increased sales. In Malad, Hess Pumice Products opened a second grinding plant, designed exclusively for their mined mineral, a fine pumice used for polishing television screens. Products from the new $3-million facility, opened in April, are exported to many countries. Also in Malad, the National Perlite Products Co. plant and Oglebay-Norton Co.'s mine was bought by Idaho Minerals Inc., a subsidiary of Moneta Porcupine Mines Inc. of Timmins, Ontario. Idaho Minerals planned to build a new, modern facility near Virginia, ID, to better access rail transport. Emerald Creek Garnet Co., the Nation's largest garnet producer, and other industrial mineral operations continued.

Exploration projects in Idaho principally targeted precious metals, but cobalt, base metals, and phosphate also attracted interest. Noteworthy exploration projects in north Idaho were conducted by Idaho Consolidated Metals Corp. (ICMC) and Cyprus Amax Minerals Co. in the Orogrande Shear Zone west of Elk City in Idaho County. ICMC acquired the Buffalo Gulch deposit, previously drilled and permitted by Bema Inc., in 1990, but never mined.

Major exploration projects in Lemhi County included Formation Capital Corp.'s Sunshine project in the Blackbird Mining District. A 6,400-meter drilling program and major mapping and sampling effort targeted syngenetic cobalt-copper-gold mineralization on the large property. Environmental remediation work, lead by the U.S. Environmental Protection Agency, was underway on the adjacent patented claims at Blackbird. Cominco Ltd. also drilled in the Iron Creek area, and Double Creek Mining Co. drilled the Salmon Canyon copper prospect on the northwest end of the Idaho Cobalt Belt. Atlas Precious Metals Inc. acquired the Musgrove project, and American Gold Resources Corp. was bought by Ashanti Goldfields Corp. Ltd. (Ghana), an African company, that was trying to sell its Ditch Creek and Arnett Creek properties near Salmon.

In central Idaho, USMX Inc. was conducting baseline studies and permitting activities after the company filed a notice to operate a seasonal heap-leach open pit gold mine at the Dewey property in the Thunder Mountain mining district. The mine plan calls for a yearly production of about 1,200 kilograms of gold and double that in silver over the 5- to 6-year mine life. Dakota was exploring at its Stibnite property, and Dakota and Hecla agreed to jointly develop the sulfide resource at Stibnite. In Custer County, Cambior USA Inc. drilled more than 20 core holes on the Sultana project at the Empire Copper Mine in search of skarn-related copper-gold mineralization. Biomyne Inc. drilled a hole near Ketchum, and Curator American (a subsidiary of International Curator Resources Ltd.) abandoned their DSA project in part because of the opposition of local environmentalists. Ownership of the Atlanta project in Elmore County changed hands when Ramrod Gold Corp. was taken over by Quest International

Resources Corp., which is conducting a feasiblity study of the 31-ton gold resource.

Gold exploration in southwestern Idaho included drilling by Golconda Mining Corp. at the Consolidated Mercury prospect in Washington County and drilling and trenching by International Freegold Minerals Development Inc. at the Idaho Almaden Mine east of Weiser. Echo Bay Exploration Ltd. explored the Kilgore prospect in Clark County of eastern Idaho. They drilled 4,900 meters of cores, with helicopter support, and 3,400 meters of reverse circulation rotary on the epithermal, volcanic-hosted system and received a Land Board award for their environmental work on the site.

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[1] The terminologies "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (for examination, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Virginia Gillerman, Research Economic Geologist, authored the text of the Idaho mineral industry information submitted by the Idaho Geological Survey.

[3] All tons are metric unless otherwise specified.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN IDAHO 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1994		1995		1996 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
Clays		--	--	1	10	1	10
Gemstones		NA	287	NA	346	NA	365
Gold 3/	kilograms	W	W	8,850	110,000	9,300	117,000
Sand and gravel:							
Construction		14,500	46,300	13,200	43,500	11,600	37,700
Industrial		W	W	501	8,720	641	8,720
Silver 3/	metric tons	W	W	182	30,200	194	33,100
Stone (crushed)		4,160	20,300	3,210 4/	14,000 4/	2,800 4/	12,600 4/
Combined value of antimony, cement, copper, feldspar, garnet (industrial), lead, lime, molybdenum, phosphate rock, pumice and pumicite, stone [crushed miscellaneous (1995-96), dimension marble and miscellaneous (1994), dimension quartzite (1995-96)], vanadium ore, zinc, and values indicated by symbol W		XX	273,000	XX	303,000	XX	202,000
Total		XX	340,000	XX	510,000	XX	411,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.
1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/ Data are rounded to three significant digits; may not add to totals shown.
3/ Recoverable content of ores, etc.
4/ Excludes certain stones; value included with "Combined value" data.

TABLE 2
IDAHO: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	W	W	$3.60
Filter stone	5	$33	6.60
Other coarse aggregate	159	572	3.60
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	1.10
Bituminous aggregate, coarse	95	378	3.98
Bituminous surface-treatment aggregate	15	40	2.67
Railroad ballast	W	W	6.29
Fine aggregate (-3/8 inch):			
Stone sand, bituminous mix or seal	22	86	3.91
Screening, undesignated	1	5	5.00
Coarse and fine aggregates:			
Graded road base or subbase	674	2,640	3.92
Unpaved road surfacing	123	550	4.47
Crusher run or fill or waste	153	649	4.24
Other construction materials	14	70	5.00
Chemical and metallurgical:			
Cement manufacture	328	661	2.02
Lime manufacture	400	2,000	5.00
Flux stone	231	1,160	5.02
Special: Other fillers or extenders	9	124	13.80
Unspecified: 3/			
Actual	847	4,430	5.23
Estimated	136	590	4.34
Total	3,210	14,000	4.36

W Withheld to avoid disclosing company proprietary data; included with "Other construction m

1/ Includes granite, limestone, quartzite, shell, traprock, and volcanic cinder and scoria; excludes miscellaneous stone from State total to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes production reported without a breakdown by end use and estimates for nonresponden

TABLE 3
IDAHO: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994				1995			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	6	407	$1,400	$3.44	8	873	$3,380	$3.87
Granite	8 r/	356 r/	1,930 r/	5.42 r/	8	611	3,370	5.52
Traprock	31	2,230	9,440	4.24	30	1,390	5,700	4.10
Shell	2	W	W	4.08	1	8	42	5.25
Volcanic cinder and scoria	1	W	W	5.67	--	--	--	--
Quartzite	7	556	4,800 r/	8.63 r/	7	328	1,500	4.58
Miscellaneous stone	7 r/	567 r/	2,540 r/	4.49 r/	(2/)	(2/)	(2/)	(2/)
Total	XX	4,160	20,300	4.89	XX	3,210	14,000	4.36

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Excludes miscellaneous stone from State total to avoid disclosing company proprietary data.

TABLE 4
IDAHO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate and concrete products 2/	1,800	$7,580	$4.22
Asphaltic concrete aggregates and other bituminous mixtures	1,700	7,080	4.16
Road base and coverings	4,730	15,200	3.22
Fill	917	2,140	2.33
Snow and ice control	108	426	3.94
Railroad ballast	20	73	3.65
Other 3/	94	290	3.09
Unspecified: 4/			
Actual	1,290	3,510	2.73
Estimated	2,540	7,210	2.83
Total or average	13,200	43,500	3.30

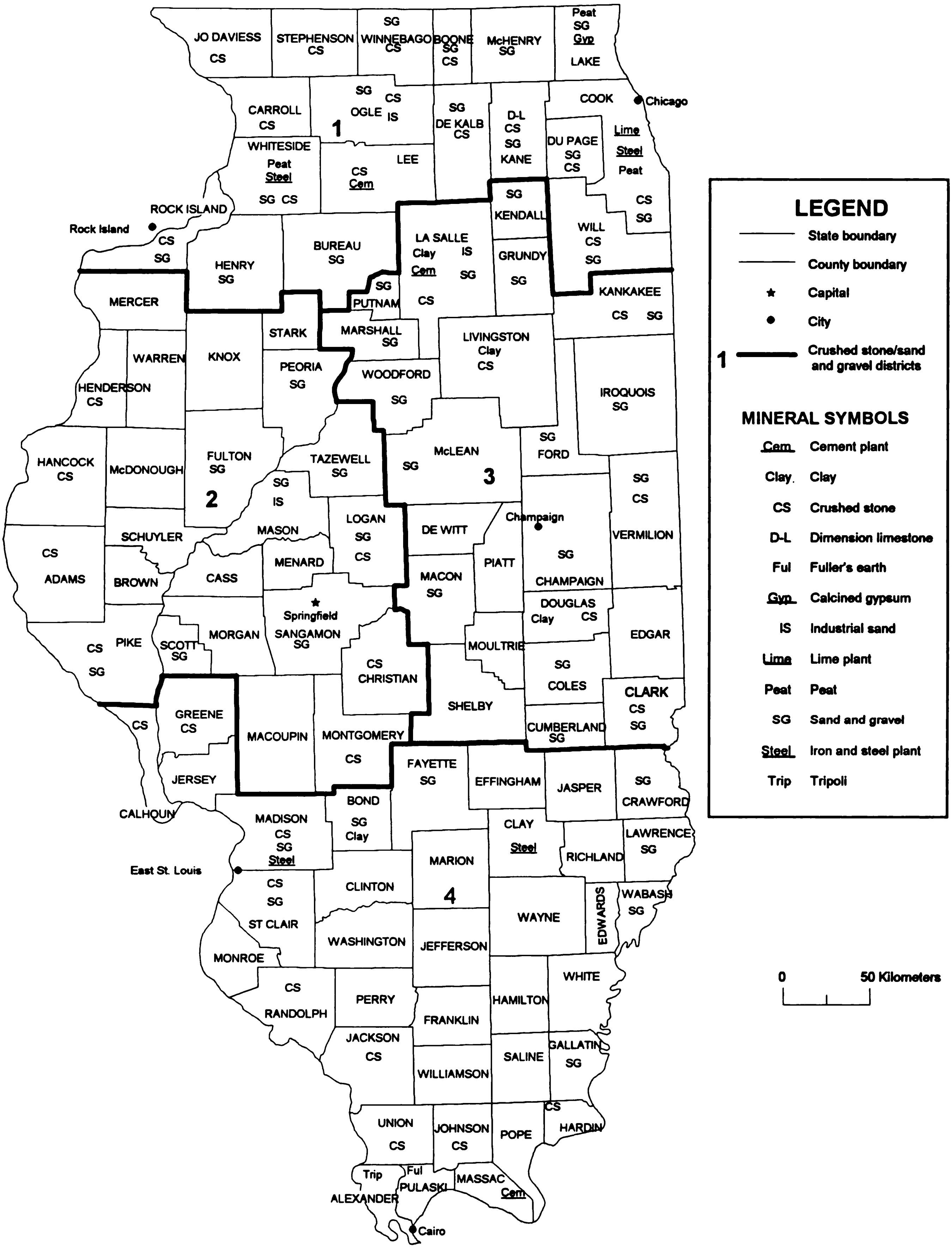
1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes filtration.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

ILLINOIS



Source: Illinois State Geological Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF ILLINOIS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Illinois State Geological Survey for collecting information on all nonfuel minerals.

In 1996, for the seventh year in a row and the ninth in the last 11 years, Illinois ranked 16th among the 50 States in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $817 million, around a 1% decrease from the $828 million achieved in 1995. This followed a marginal increase in 1995 (based on final 1995 data) from that of 1994. The State accounted for more than 2% of the U.S. total nonfuel mineral production value.

Virtually all of Illinois' total nonfuel mineral value in 1996 resulted from the production of industrial minerals. In terms of nonfuel mineral value, crushed stone was the State's leading commodity, accounting for about 45% of the total, followed by portland cement with 21%, and construction sand and gravel with 17%. In 1996, an 8.5% increase in the estimated value of crushed stone, in part, offset the combined moderate decreases in lime, fluorspar, zinc, and both construction and industrial sand and gravel. The values of the following commodities also showed small decreases in 1996: portland cement, common clays, and gemstones.

Compared with USGS estimates of the quantities of minerals produced in the other 49 States, Illinois remained first in industrial sand and gravel and tripoli in 1996; third in peat; fourth in fuller's earth clays; fifth in crushed stone; and seventh in lime. The State dropped from seventh to eighth in the production of construction sand and gravel and from eighth to ninth in portland cement. Illinois, the only fluorspar-producing State, had one-sixth as much production as in 1995 as part of the closing of its last two remaining fluorspar mines. Only a small quantity of zinc was still produced in the State. Raw steel was produced in Illinois, but it was processed from materials obtained from other domestic and foreign sources. Illinois rose from fifth to fourth in the Nation in the manufacture of raw steel with an estimated output of 7.4 million metric tons (8.2 million short tons), according to the American Iron and Steel Institute.

The following narrative information was provided by the Illinois State Geological Survey[2] (ISGS). The record 17-inch rainfall of July 17, 1996, that fell in Aurora (40 miles west of Chicago) caused extensive water damage in the northeastern part of the State, and was very costly to the aggregate industry. At Conco Western Stone Co.'s underground dolomite mine, north of Aurora, a dike broke which allowed water from a drainage ditch to partially flood the mine. Equipment was damaged and the mine flooding cost the company 10 weeks of production time. Other quarries that also had to shut down for an extended time included Vulcan Material Co.'s Joliet and Bollingbrook quarries, Material Service Corp.'s Romeoville quarry, and Elmhurst-Chicago Stone Co.'s Barbers Corner quarry. In general, small companies were more adversely affected than large companies which had multiple extraction sites because the latter were able to make up lost production by increasing production at other operations.

Also, in northeastern Illinois, Vulcan Materials Co. converted its lime kiln at the site of its McCook quarry in Cook County to the production of high calcium quicklime using stone shipped in from Lake Michigan sources. Vulcan had a new kiln under construction at the site of their Manteno quarry in Kankakee County that will produce dolomitic quicklime from local quarry rock. Marblehead Lime Co., a subsidiary of Calcitherm Nederland NV., idled its lime plant at Thornton, Cook County. Stone from Material Service Corp.'s (also a division of General Dynamics) Thornton quarry was shipped to Marblehead Lime's South Chicago kiln to produce dolomitic quicklime. Other products of this operation included high calcium quicklime, hydrated lime, and pulverized high-calcium quicklime.

Most of Illinois' industrial sand operations mined the St. Peter Sandstone deposit in LaSalle County. During 1996, U.S. Silica Co. in Ottawa was sold by U.S. Borax Inc., a subsidiary of RTZ Corp., to the D. George Harris Co. Through a merger agreement, Kirtland Capital Partners obtained the majority share of Fairmount Minerals Ltd., the owner of Wedron Silica Co. in Wedron. Unimin Corp. idled the mining portion of its operation at Troy Grove.

In southernmost Illinois, Ozark-Mahoning Co. (OMC), a subsidiary of Elf Atochem North America, Inc., continued to close its fluorspar operations in Hardin County. The company was down to one employee, who supervised environmental remediation work and the sale of company property and other assets. Hastie Mining and Trucking Co., a local quarry company, leased OMC's mineral drying and bagging facilities in order to process fluorspar purchased from the National Defense Stockpile. By making a calcined product, they will probably service some of OMC's former customers.

Also, in southernmost Illinois, the U.S. Army Corps of

Engineers began work on its lock and dam project on the Ohio River at the town of Olmsted in Pulaski County. The locks were undergoing construction inside a coffer dam that occupied 16 hectares of the river channel on the Illinois side. Being the Corps' largest inland waterway project in history, it will consume significant amounts of construction aggregate, portland cement, and steel. It will replace Locks and Dams 52 and 53 (completed in 1929), the last of the original series of locks and dams on the Ohio River, and will provide more efficient transportation of commodities, including construction aggregates and many other minerals and mineral products.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (e.g., construction sand and gravel, crushed stone, and portland cement,) estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] John Masters, Senior Staff Geologist with the Illinois State Geological Survey, authored the text of State minerals information provided by that agency.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ILLINOIS 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement (portland)	2,590	151,000	2,560	169,000	2,540	168,000
Clays	494 3/	1,170 3/	504	1,220 3/	792	627 3/
Gemstones	NA	376	NA	269	NA	W
Sand and gravel:						
Construction	37,900	150,000	36,100	147,000	35,400	142,000
Industrial	4,420	65,700	4,410	67,500	4,360	62,600
Stone (crushed)	62,600 4/	353,000 4/	61,400	335,000	65,000	364,000
Combined value of barite, cement [masonry (1994)], clays (fuller's earth), copper (1994-95), fluorspar, lead (1994-95), lime, peat, silver (1994-95), stone [crushed miscellaneous (1994), dimension dolomite (1994)], tripoli, zinc, and value indicated by symbol W	XX	102,000	XX	107,000	XX	79,700
Total	XX	823,000	XX	828,000	XX	817,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.
1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/ Data are rounded to three significant digits; may not add to totals shown.
3/ Excludes certain clays; kind and value included with "Combined value" data.
4/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
ILLINOIS: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	854	$4,180	$4.89
Riprap and jetty stone	557	4,490	8.06
Filter stone	156	688	4.41
Other coarse aggregate	356	1,690	4.75
Coarse aggregate, graded:			
Concrete aggregate, coarse	5,760	30,600	5.31
Bituminous aggregate, coarse	4,940	29,900	6.05
Bituminous surface-treatment aggregate	1,230	7,280	5.92
Railroad ballast	519	2,790	5.38
Other graded coarse aggregate	1,840	8,610	4.68
Fine aggregate (-3/8 inch):			
Stone sand, concrete	435	1,900	4.37
Stone sand, bituminous mix or seal	234	1,170	5.00
Screening, undesignated	682	2,320	3.40
Other fine aggregate	324	1,420	4.38
Coarse and fine aggregates:			
Graded road base or subbase	9,940	44,500	4.48
Unpaved road surfacing	2,560	11,200	4.38
Crusher run or fill or waste	366	1,290	3.52
Other coarse and fine aggregates	1,080	4,700	4.35
Other construction materials	43	135	3.14
Agricultural:			
Agricultural limestone	2,580	10,800	4.19
Poultry grit and mineral food	100	1,460	14.60
Other agricultural uses	6	18	3.00
Chemical and metallurgical:			
Cement manufacture	3,530	13,800	3.91
Flux stone	W	W	5.29
Chemical stone	433	2,050	4.73
Sulfur oxide removal	W	W	3.42
Special:			
Mine dusting or acid water treatment	14	147	10.50
Asphalt fillers or extenders	14	183	13.10
Whiting or whiting substitute	W	W	11.00
Other fillers or extenders	464	24,200	52.20
Unspecified:			
Actual	12,200	69,000	5.66
Estimated	9,650	51,800	5.37
Total	61,400	335,000	5.46

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Includes dolomite, limestone, and limestone-dolomite.

2/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 3
ILLINOIS: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	141 r/	49,600 r/	$285,000 r/	$5.75 r/	133	48,000	$264,000	$5.51
Dolomite	21 r/	13,000 r/	67,400 r/	5.20 r/	22	13,400	71,200	5.29
Miscellaneous stone	1	7	37	5.29	--	--	--	--
Total	XX	62,600	353,000	5.64	XX	61,400	335,000	5.46

r/ Revised. XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes limestone-dolomite reported with no distinction between the two.

TABLE 4
ILLINOIS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 2/	898	4,950	258	1,590	334	2,150	433	2,350
Coarse aggregate, graded 3/	7,200	41,200	W	W	3,150	18,900	W	W
Fine aggregate (-3/8 inch) 4/	918	3,760	W	W	308	1,150	W	W
Coarse and fine aggregate 5/	7,210	30,500	897	4,260	2,640	12,400	3,200	14,500
Other construction materials	41	128	1,150	5,540	1	7	3,250	15,400
Agricultural 6/	(7/)	(7/)	(7/)	(7/)	919	4,460	852	3,660
Chemical and metallurgical 8/	(7/)	(7/)	(7/)	(7/)	(7/)	(7/)	1,140	4,970
Special 9/	(7/)	(7/)	(7/)	(7/)	(7/)	(7/)	--	--
Unspecified: 10/								
Actual	8,660	45,300	2,510	17,300	970	6,020	56	327
Estimated	4,130	21,700	926	4,460	1,760	10,000	2,830	15,600
Total	30,800	154,000	7,200	62,500	11,700	62,100	11,800	56,800

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other coarse aggregate.

4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

5/ Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

6/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

7/ Withheld to avoid disclosing company proprietary data; included in "Total."

8/ Includes cement manufacture, chemical stone for alkali works, flux stone, and sulfur oxide removal.

9/ Includes asphalt fillers or extenders, mine dusting or acid water treatment, other fillers or extenders, and whiting or whiting substitute.

10/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
ILLINOIS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	7,200	$27,400	$3.81
Plaster and gunite sands	323	1,320	4.08
Concrete products (blocks, bricks, pipe, decorative, etc.)	895	3,720	4.15
Asphaltic concrete aggregates and other bituminous mixtures	1,850	7,510	4.06
Road base and coverings 2/	7,270	37,700	5.18
Fill	3,190	11,800	3.70
Snow and ice control	40	228	5.70
Filtration	17	113	6.65
Other 3/	289	1,400	4.85
Unspecified: 4/			
Actual	10,500	41,500	3.97
Estimated	4,600	14,500	3.16
Total or average	36,100	147,000	4.07

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Includes railroad ballast and roofing granules.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
ILLINOIS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	4,350	17,600	1,010	3,580	1,940	7,300	1,120	3,930
Asphaltic concrete aggregates and road base materials 3/	8,490	42,200	912	3,290	1,800	8,220	1,150	3,550
Other miscellaneous uses 4/	219	1,030	19	120	69	364	--	--
Unspecified: 5/								
Actual	8,540	35,800	792	3,410	1,120	2,260	--	--
Estimated	2,120	6,850	472	1,260	1,240	3,460	772	2,960
Total	23,700	103,000	3,210	11,700	6,170	21,600	3,040	10,400

1/ Data are rounded to three significant digits; may not add to totals shown.

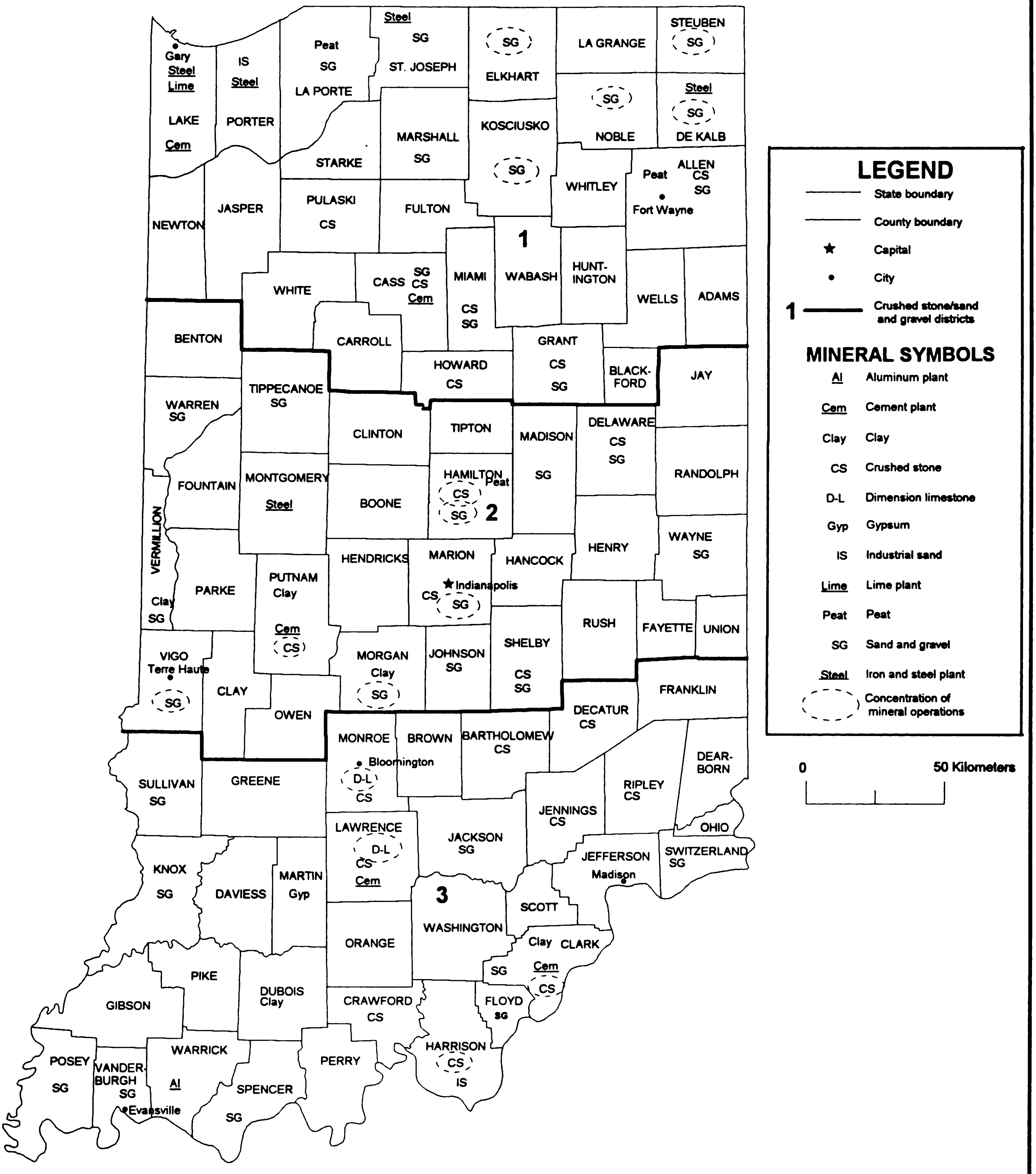
2/ Includes plaster and gunite sands.

3/ Includes fill, road and other stabilization (cement), and snow and ice control.

4/ Includes filtration, railroad ballast and roofing granules.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

INDIANA



Source: Indiana Geological Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF INDIANA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Indiana Geological Survey for collecting information on all nonfuel minerals.

Indiana ranked 21st among the 50 States in total nonfuel mineral production value[1] in 1996, according to the U.S. Geological Survey (USGS). Although dropping from a ranking of 20th in 1995, Indiana's 1996 estimated value of $617 million was nearly a 5% increase from that of 1995. This followed a more than 6% increase from 1994 to 1995 (based on final 1995 data). Indiana's nonfuel mineral production value exceeded $600 million for the first time in its history in 1996. The State accounted more than 1.5% of the U.S. total nonfuel mineral production value.

Indiana's increase in nonfuel mineral value mostly resulted from an 11% increase in the value of crushed stone and a 14% increase in construction sand and gravel. Compared with those of 1995, other values that increased were those of gypsum, common clays, and peat. Mineral commodities that showed a decrease in value included portland cement, lime, masonry cement, dimension stone, and gemstones.

Compared with USGS estimates of the quantities of minerals produced in the other 49 States during 1996, Indiana remained first in dimension stone, second in masonry cement, and seventh in gypsum. Additionally, the State was a significant producer of crushed stone, portland cement, construction sand and gravel, lime and common clays. The State's mines exclusively produce industrial minerals and coal; all raw steel and primary aluminum produced in the State are processed from materials received from other domestic and foreign sources. Indiana continued to lead the Nation in the production of raw steel with an estimated output of close to 21 million metric tons (23 million short tons), according to the American Iron and Steel Institute. The State remained third in the production of primary aluminum.

The following narrative information was provided by the Indiana Geological Survey (IGS).[2] In 1996, two limestone quarries were opened in Orange County. Mulzer Crushed Stone, Inc., opened a new quarry at Abydel west of Paoli, and Rogers Group, Inc., reopened an old quarry near Orleans. Both quarries will produce scrubber stone for coal-fired electric utilities with wet flue gas desulfurization systems. Mulzer Crushed Stone, Inc., announced plans to open a quarry in Harrison County. The county approved significant tax abatements to encourage the development. This quarry would also be primarily producing limestone for scrubber stone. The D & R Crushed Stone Co. ceased production at the Indiana Limestone Co., Inc., Crown Quarry property in Monroe County where it processed waste overburden. The owner of D & R attempted to open a new crushed stone quarry south of Bloomington, but a decision by the Monroe County Board of Zoning Appeals put the development on hold. The property is being sold to Rogers Group, Inc., who is reapplying for a zoning permit. Following an appeal by opponents, the Indiana Court of Appeals upheld a decision by the Monroe County Zoning Board to allow development of Hillside Stone Co.'s planned underground crushed limestone mine west of Bloomington.

The Indiana Limestone Institute reported that 1996 was a very good year for the State's dimension limestone industry. Construction projects for which Indiana quarries were providing stone included: federal courthouses in Sacramento, CA, and Portland, OR; the Niketown store in NewYork; the North Carolina Museum of Natural History in Raleigh, NC; Catherwood Library on the campus of Cornell University in Ithaca, NY; and Doubleday Field at the U.S. Military Academy at West Point, NY. Restoration projects were also underway of the Empire State Building and the Waldorf Astoria in New York City. The Indiana Limestone Company, Inc., came under new management during the year. Plans were made to update and modernize the company's equipment and new office facilities were constructed. Additionally, the company finished the International Cultural and Trade Center for the Federal Triangle project in Washington, DC earlier in 1996.

Silver Creek Sand & Gravel, Inc., continued to excavate sand and gravel at its pit in Floyd County despite problems with neighbors regarding a nearby archaeological site and flood plain concerns. Irving Materials, Inc., experienced zoning problems in its attempt to open a sand and gravel pit in Johnson County. ESSROC Materials, Inc.'s, Speed Cement Plant in Clark County, investigated the option of setting up a citizen's advisory committee to deal with neighborhood concerns. ESSROC quarries some of the materials used at its Speed Plant. The Hoosier National Forest agreed to a 'land for mineral right's swap' with the United States Gypsum Corp. (USG) in which the forest will gain a total of 281 hectares including unique karst areas, and USG will gain the right to mine less than 470 hectares of national forest in Martin County.

Regarding federal environmental grants, the Indiana Department of Environmental Management (IDEM) will henceforth identify needed programs in the State with the help of other public and business groups. The United

States Environmental Protection Agency (EPA) will then work with IDEM to establish goals and methods of measuring progress toward those goals and will award the State one lump-sum grant instead of multiple project-specific grants as in the past. The Indiana Department of Natural Resources published the Indiana Wetlands Conservation Plan funded by a grant from the EPA.

In aggregate news, a final version of the Indiana Department of Transportation's (INDOT) regulation ITM 203-96, which defines how an aggregate producer supplies stone for an INDOT contract, was released, including the new requirement to use metric units. A national conference called Superpave 2000 was held in Indianapolis during August. Trips were made to Superpave sites and testing centers in Indiana, including a portion of I-70. The I-70 project includes a German-made asphalt tape joint sealant, the first project in the nation to use this method. A draft environmental impact statement could find no insurmountable environmental problems in extending I-69 from Indianapolis to Evansville, but was criticized by the EPA for being incomplete and for not sufficiently examining alternatives. Public hearings were held around the State in May and June. INDOT sent out an invitation to engineering firms to help plan the highway. Seven companies were chosen to design portions of the extension.

The steel industry had a very active year in 1996. In November, AK Steel Corp. announced that it would build a state-of-the-art steel finishing plant near Rockport, Spencer County. This proposed plant was among, if not, the most expensive business development in the nation during 1996 at an estimated cost of $1.1 billion with State and local business incentives totaling $72 million. The plant will be 65 kilometers southeast of the new Toyota pickup truck plant being constructed near Princeton, Gibson County, and will be a major supplier of steel for Toyota, as well as for other industries in the region. Completion of the steel plant was anticipated for September 1998. Plans were underway to make many regional road improvements to service the new business developments. In other industry news, Chicago Cold Rolling LLC, a $50 million steel minimill, was scheduled to open at Burns Harbor, Porter County, in 1997. Qualitech Steel Corp. moved its site for a minimill to the Pittsboro area, Hendricks County, after facing significant opposition in Brownsburg. Inland Steel Co., Lake County, planned to spend $240 million to make improvements to its plant. Inland also entered into an agreement with a Tennessee company to build a coking facility for the plant. Excess heat produced by the process will be converted into electricity for the plant. Bethlehem Steel Corp., Porter County, offered to donate steel for a new $74.9 million high school at Chesterton. The company announced that it was looking for new suppliers of lime and limestone. In April, Bethlehem Steel Corp. and Inland Steel Co. were fined by the EPA for water and air pollution violations. Air pollution fines against US Steel Corp. and LTV Steel Co., both in Lake County, will be used to help clean up other environmental problems in those areas.

A new 62-page *Directory of Industrial Mineral Producers in Indiana*, Indiana Geological Survey D13, was published in January. The directory was also available in spreadsheet form on a 3.5-inch computer disk. Updates of maps showing active mine locations in Indiana were completed in 1996: map MM55, *Map of Indiana Showing Bedrock Units Containing Thick Deposits of Limestone and Dolomite and Locations of Coal-Fired Electric Power Plants and Crushed-Stone Mines*, and map MM57, *Map of Indiana Showing Locations of Coal-Fired Electric Power Plants, Crushed-Stone Mines, and Federal and State Highways*. Map MM41, *Map of Indiana Showing Locations of Coal and Industrial Minerals Operations*, was revised and was scheduled to be available in 1997.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of Feb. 1997. For some commodities, e.g., construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: http://minerals.er.usg.gov/minerals /contacts/comdir.html

[2] Ms Kathryn Shaffer authored the text of State minerals information submitted by the Indiana Geological Survey.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN INDIANA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement (portland)	2,290	132,000	2,330	143,000	2,280	140,000
Clays	774 3/	2,540 3/	915	3,350 3/	837	3,520
Gemstones	NA	29	NA	36	NA	W
Peat	23	W	17 4/	281 4/	W	W
Sand and gravel (construction)	28,100	108,000	24,900	93,900	26,700	107,000
Stone:						
Crushed	45,900	211,000	49,200	234,000 5/	53,500	260,000 5/
Dimension metric tons	173,000	25,800	172,000	31,400	190,000	29,500
Combined value of cement (masonry), clays [ball (1994-95)], gypsum (crude), lime, sand and gravel (industrial), stone [crushed slate (1995-96)], and values indicated by symbol W	XX	75,400	XX	82,700	XX	77,400
Total	XX	555,000	XX	589,000	XX	617,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value" figure.

4/Data series changed to production beginning in 1995, prior years shipment data may not be comparable.

5/ Excludes certain stones; kind and value included with "Combined value" figure.

TABLE 2
INDIANA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	60	$219	$3.65
Riprap and jetty stone	1,130	5,060	4.48
Filter stone	286	1,430	5.01
Other coarse aggregate	763	4,260	5.58
Coarse aggregate, graded:			
Concrete aggregate, coarse	5,260	20,500	3.90
Bituminous aggregate, coarse	3,660	14,800	4.05
Bituminous surface-treatment aggregate	1,810	6,920	3.82
Railroad ballast	176	737	4.19
Other graded coarse aggregate	190	659	3.47
Fine aggregate (-3/8 inch):			
Stone sand, concrete	234	770	3.29
Stone sand, bituminous mix or seal	168	883	5.26
Screening, undesignated	241	1,100	4.56
Other fine aggregate	189	806	4.26
Coarse and fine aggregates:			
Graded road base or subbase	4,180	20,000	4.78
Unpaved road surfacing	3,680	16,900	4.60
Terrazzo and exposed aggregate	(3/)	3	24.20
Crusher run or fill or waste	947	3,990	4.21
Other coarse and fine aggregates 4/	535	2,250	4.21
Agricultural: Agricultural limestone 5/	1,520	6,390	4.19
Chemical and metallurgical:			
Cement manufacture	2,510	4,060	1.62
Dead-burned dolomite manufacture	(6/)	(6/)	4.14
Flux stone	(6/)	(6/)	5.21
Glass manufacture	(6/)	(6/)	13.10
Sulfur oxide removal	674	2,540	3.77
Special:			
Asphalt fillers or extenders	(6/)	(6/)	7.13
Whiting or whiting substitute	(6/)	(6/)	10.70
Unspecified: 7/			
Actual	17,900	102,000	5.72
Estimated	2,840	14,200	4.98
Total	49,200	234,000	4.76

1/ Includes dolomite, limestone, limestone-dolomite, and slate quantity only; excludes slate value from State total to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Less than 1/2 unit.

4/ Includes lightweight aggregate (slate).

5/ Includes other agricultural uses.

6/ Withheld to avoid disclosing company proprietary data; included in "Total."

7/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
INDIANA: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	70 r/	37,400 r/	$172,000 r/	$4.60 r/	73	42,400	$201,000	$4.74
Dolomite	14 r/	8,450 r/	39,600 r/	4.69 r/	14	6,760	33,500	4.96
Slate	--	--	--	--	1	74	(3/)	(3/)
Total	XX	45,900	211,000	4.60	XX	49,200	234,000	4.76

r/ Revised. XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes limestone-dolomite reported with no distinction between the two.

3/ Excludes slate value from State total to avoid disclosing company proprietary data.

TABLE 4
INDIANA:1/ CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	W	W	W	W	859	3,670
Coarse aggregate, graded 4/	2,660	12,000	889	5,130	7,540	26,500
Fine aggregate (-3/8 inch) 5/	W	W	W	W	146	308
Coarse and fine aggregate 6/	6,430	28,200	2,230	11,900	2,750	13,600
Agricultural 7/	726	3,280	191	1,010	607	2,100
Chemical and metallurgical 8/	(9/)	(9/)	(9/)	(9/)	(9/)	(9/)
Special 10/	--	--	(9/)	(9/)	(9/)	(9/)
Unspecified: 11/						
Actual	(9/)	(9/)	9,150	55,600	(9/)	(9/)
Estimated	1,790	9,070	666	3,140	390	1,970
Total	14,800	69,500	14,100	79,500	20,300	85,300

W Withheld to avoid disclosing company proprietary data; included with "Coarse and fine aggregate."

1/ Excludes slate value from State total to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes graded road base or subbase, lightweight aggregate (slate), terrazzo and exposed aggregate, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

7/ Includes agricultural limestone and other agricultural uses.

8/ Includes cement manufacture, dead-burned dolomite manufacture, flux stone, glass manufacture, and sulfur oxide removal.

9/ Withheld to avoid disclosing company proprietary data; included in "Total."

10/ Includes asphalt fillers or extenders, and whiting or whiting substitute.

11/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
INDIANA: CONSTRUCT0ION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	7,950	$29,700	$3.74
Plaster and gunite sands	105	495	4.71
Concrete products (blocks, bricks, pipe, decorative, etc.)	126	628	4.98
Asphaltic concrete aggregates and other bituminous mixtures	1,610	5,610	3.48
Road base and coverings 2/	1,430	5,990	4.19
Fill	2,290	7,770	3.39
Snow and ice control	269	777	2.89
Roofing granules	W	W	7.50
Filtration	W	W	6.40
Other 3/	187	1,030	5.51
Unspecified: 4/			
Actual	7,670	32,000	4.17
Estimated	3,240	9,930	3.06
Total or average	24,900	93,900	3.77

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement and lime).

3/ Includes filtration and roofing granules.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
INDIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	1,500	5,130	4,130	19,000	2,550	6,750
Asphaltic/bituminous mixtures	679	2,240	365	1,600	564	1,770
Road base and coverings 3/	480	2,120	752	2,950	201	920
Fill	377	1,090	1,580	5,820	328	860
Snow and ice control	131	359	96	302	43	116
Other miscellaneous uses 4/	54	277	131	742	2	15
Unspecified: 5/						
Actual	814	3,680	4,990	20,500	1,870	7,760
Estimated	2,020	6,060	321	864	907	3,010
Total	6,050	21,000	12,400	51,800	6,470	21,200

1/ Data are rounded to three significant digits; may not add to totals shown.

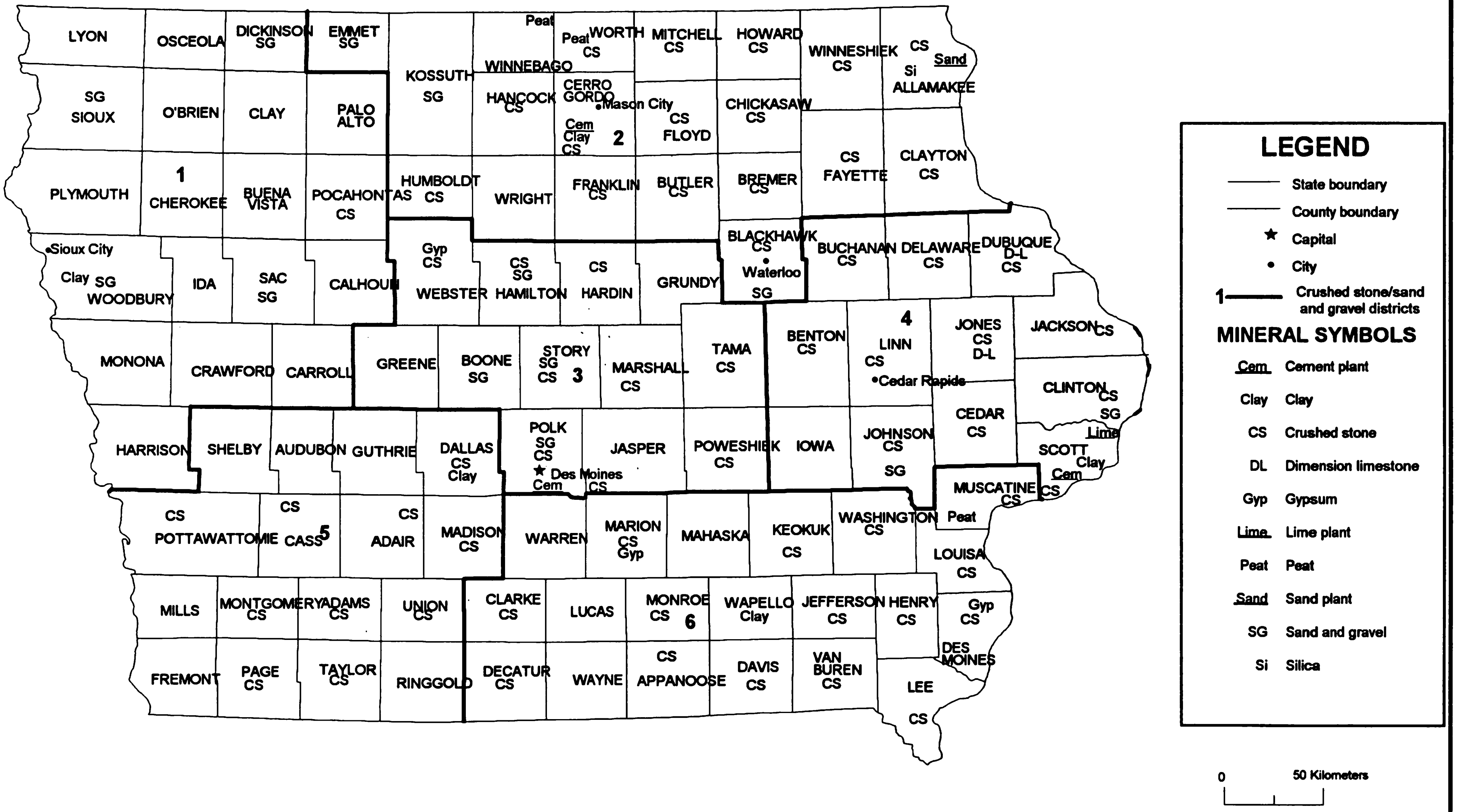
2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement and lime).

4/ Includes filtration and roofing granules.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

IOWA



Source: Iowa Geological Survey Bureau/U.S. Geological Survey

THE MINERAL INDUSTRY OF IOWA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Iowa Geological Survey Bureau for collecting information on all nonfuel minerals.

In 1996, Iowa moved up one place in rank to 28th among the 50 States in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $486 million, about a 7% increase from that of 1995. This followed a 1% increase from 1994 to 1995 (based on final 1995 data). The State accounted for more than 1% of the U.S. total nonfuel mineral production value.

Crushed stone remained the leading commodity, accounting for more than 42% of the State's total nonfuel mineral value, followed by portland cement with nearly 38% and construction sand and gravel with almost 14%. Most of Iowa's increased nonfuel mineral production value was the result of a $24 million increase in portland cement and about a $10 million increase in construction sand and gravel. Compared with 1995, the other mineral commodity values that increased in 1996 were crude gypsum and peat. Decreases occurred in crushed stone, lime, masonry cement, and common clays.

Compared with USGS estimates of quantities produced in the other 49 States, Iowa remained second in crude gypsum. The State rose from 10th to 8th in portland cement. Additionally, the State was a significant producer of crushed stone, construction sand and gravel, and common clays. No metals were mined in Iowa; all of the State's metal production resulted from the processing of materials acquired from other domestic and foreign sources.

The following narrative information was provided by the Geological Survey Bureau[2] (GSB) of the Iowa Department of Natural Resources. In 1996, 238 licensed operators produced nonfuel minerals from 1,064 registered mine and quarry sites compared with 1,044 registered sites during 1995. County governments accounted for 31 of the 238 operators.

Throughout the year, Vulcan Materials Co. continued to close sites which had not been transferred to Wendling Quarries Inc. during Wendling's 1995 acquisition of Vulcan's Iowa operations.

As part of the GSB's participation in the USGS-sponsored State map program, the GSB published a new map delineating aggregate resources in the fast-growing Linn County area. The publication, entitled *Aggregate Resources of the Cedar Rapids North and Marion Quadrangles Linn County Project Map #3*, was available from the Bureau's Iowa City office for $5.

In spring, the Community Economic Betterment Division of the Iowa Department of Economic Development awarded a forgivable loan ($87,500) and a no-interest loan ($87,500) to Sioux City Brick & Tile Co. to assist the company in a $12 million new plant upgrade. The forgivable loan was dependent on the company maintaining 70 full-time employees at the Sergeant Bluff plant and 102 full-time employees at the Adel plant. The company envisioned the plant renovation to be a 2-year project with start date of March 1, 1996.

Dodger Industries, Inc. opened Grell's Quarry, the first independently owned gypsum quarry in the Fort Dodge gypsum district in decades. After 3 years of plans and tests, the owner began mining a 24-hectare gypsum field that lies under the rolling hillsides south of the Des Moines River. He anticipated mining 1,100 to 1,800 metric tons-per-day and marketing the gypsum rock to Georgia Pacific Corp.'s wall board plant. Gypsum at the site is up to 10 meters deep in places and has an average thickness of about 5 meters. When running at full capacity, Grell's quarry was expected to become a reliable source of gypsum, especially for a number of local plants which are always looking for new sources of gypsum.

In May, Guardian Industries Corp. began construction of a float glass plant in Dewitt, IO. Float glass as well as tempered glass will be manufactured at the large-scale $110 million facility. Other value-added fabricated glass products are also likely to be produced at the plant in the future. The new float glass manufacturing line will be Guardian's seventh U.S. float line and will provide a strong complement to Guardian's existing U.S. facilities. Guardian owns 15 plants worldwide. The plant will create approximately 250 to 300 new jobs. Hundreds of additional jobs will be created due to the plant's contribution to the local and regional economy. The plant's high quality float glass will be used by customers in the manufacture of such items as windows, doors, tabletops, mirrors, skylights, and commercial building curtain walls. Some of the silica sand used in the glass production process may be sourced from high purity silica sand deposits in Iowa and adjacent Illinois.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities, e.g., construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone phone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: http:// minerals. er. usgs .gov/ minerals /contacts/comdir.html

[2] Robert McKay, Research Geologist, authored the text of minerals information provided by the Geological Survey Bureau of Iowa.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN IOWA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement (portland)	2,390	153,000	2,340	161,000	2,690	185,000
Clays	384	1,520	322	1,590	301	1,450
Gemstones	NA	50	NA	57	NA	W
Gypsum (crude)	2,210	12,700	2,240	13,800	2,380	14,000
Peat	5	W	5 3/	77 3/	W	W
Sand and gravel (construction)	15,300	58,200	14,300	57,000	15,900	66,800
Stone (crushed)	36,600 4/	211,000	35,300	210,000	34,400	206,000
Combined value of cement (masonry), lime, sand and gravel (industrial), stone [crushed dolomite and miscellaneous (1994), dimension (1994), dimension dolomite and limestone (1996), dolomite and sandstone (1995)], and values indicated by symbol W	XX	14,800	XX	12,500	XX	12,500
Total	XX	451,000	XX	456,000	XX	486,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/Data series changed to production beginning in 1995, prior years shipment data may not be comparable.

4/ Excludes certain stones; value included with "Combined value" data.

TABLE 2
IOWA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	332	$1,300	$3.91
Riprap and jetty stone	251	1,550	6.19
Filter stone	275	1,280	4.64
Other coarse aggregate	210	1,450	6.89
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,550	10,100	6.52
Bituminous aggregate, coarse	580	3,660	6.31
Bituminous surface-treatment aggregate	121	795	6.57
Other graded coarse aggregate	226	1,540	6.82
Fine aggregate (-3/8 inch):			
Stone sand, concrete	59	182	3.08
Stone sand, bituminous mix or seal	97	388	4.00
Screening, undesignated	103	414	4.02
Other fine aggregate	95	505	5.32
Coarse and fine aggregates:			
Graded road base or subbase	2,650	15,700	5.92
Unpaved road surfacing	2,910	13,500	4.65
Crusher run or fill or waste	261	880	3.37
Other coarse and fine aggregates	675	4,410	6.53
Other construction materials 3/	213	1,630	7.63
Agricultural: Agricultural limestone 4/	1,320	10,600	8.01
Chemical and metallurgical:			
Cement manufacture	2,660	20,500	7.72
Lime manufacture	(5/)	(5/)	3.94
Flux stone	(5/)	(5/)	6.14
Glass manufacture	(5/)	(5/)	11.00
Special: Asphalt fillers or extenders	(5/)	(5/)	14.00
Unspecified: 6/			
Actual	8,410	54,700	6.51
Estimated	11,600	60,900	5.26
Total	35,300	210,000	5.96

1/ Includes dolomite, limestone, limestone-dolomite, and miscellaneous stone.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes railroad ballast and roofing granules.

4/ Includes poultry grit and mineral food and other agricultural uses.

5/ Withheld to avoid disclosing company proprietary data; included in "Total."

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
IOWA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994				1995			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	227 r/	36,600	$211,000	$5.77	223	35,200	$210,000	$5.97
Dolomite	3 r/	60 r/	(3/)	(3/)	4	W	W	3.83
Miscellaneous stone	5	(4/)	W	W	4	W	W	2.81
Total	XX	36,600	211,000	5.77 r/	XX	35,300	210,000	5.95

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes limestone-dolomite reported with no distinction between the two.

3/ Excludes dolomite value from State total to avoid disclosing company proprietary data.

4/ Excludes miscellaneous stone quantity from State total to avoid disclosing company proprietary data.

TABLE 4
IOWA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

Use	District 2		District 3		District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:										
Coarse aggregate (+1 1/2 inch) 3/	W	W	W	W	528	2,400	--	--	264	1,570
Coarse aggregate, graded 4/	W	W	W	W	1,010	6,550	--	--	768	4,700
Fine aggregate (-3/8 inch) 5/	W	W	W	W	173	577	--	--	104	526
Coarse and fine aggregate 6/	2,140	11,900	671	4,780	2,640	12,500	--	--	2,300	13,800
Agricultural 7/	(8/)	(8/)	(8/)	(8/)	346	1,690	--	--	428	2,260
Chemical and metallurgical 9/	(8/)	(8/)	(8/)	(8/)	(8/)	(8/)	--	--	--	--
Special 10/	--	--	--	--	(8/)	(8/)	--	--	--	--
Unspecified: 11/										
Actual	2,550 12/	18,300 12/	4,340	27,800	524	2,120	522	3,470	469	3,030
Estimated	1,790	9,860	59	166	2,720	12,300	6,180	36,600	852	2,040
Total	8,420	60,400	5,470	38,700	9,530	43,300	6,700	40,000	5,190	27,900

W Withheld to avoid disclosing company proprietary data; included with "Coarse and fine aggregate."

1/ Production reported in District 1 was included with "District 2" to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), other coarse and fine aggregates, other construction materials, and roofing granules.

7/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

8/ Withheld to avoid disclosing company proprietary data; included in "Total."

9/ Includes cement manufacture, flux stone, glass manufacture, and lime manufacture.

10/ Includes asphalt fillers or extenders.

11/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

12/ Includes unspecified within all districts.

TABLE 5
IOWA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	2,910	$12,600	$4.33
Plaster and gunite sands	110	513	4.66
Concrete products (blocks, bricks, pipe, decorative, etc.)	86	241	2.80
Asphaltic concrete aggregates and other bituminous mixtures	441	1,860	4.22
Road base and coverings 2/	2,300	7,240	3.15
Fill	951	2,450	2.58
Snow and ice control	161	552	3.43
Other 3/	42	353	8.40
Unspecified: 4/			
Actual	2,370	12,100	5.11
Estimated	4,890	19,100	3.91
Total or average	14,300	57,000	3.99

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement and lime).

3/ Includes filtration, railroad ballast, and roofing granules.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
IOWA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	783	2,840	675	3,350	301	1,470	642	2,420	W	W	W	W
Asphaltic concrete aggregates and road base materials 3/	1,070	3,230	781	3,140	1,150	3,430	137	332	W	W	W	W
Snow and ice control	56	138	36	109	29	127	13	48	--	--	27	129
Other miscellaneous uses 4/	2	20	21	227	7	23	6	64	--	--	6	19
Unspecified: 5/												
Actual	791	4,820	187	918	843	3,910	319	1,270	--	--	228	1,190
Estimated	1,540	5,310	156	636	2,730	11,300	168	673	246	984	51	255
Total	4,240	16,400	1,860	8,370	5,050	20,200	1,290	4,810	393	1,410	1,430	5,850

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to three significant digits; may not add to totals shown.

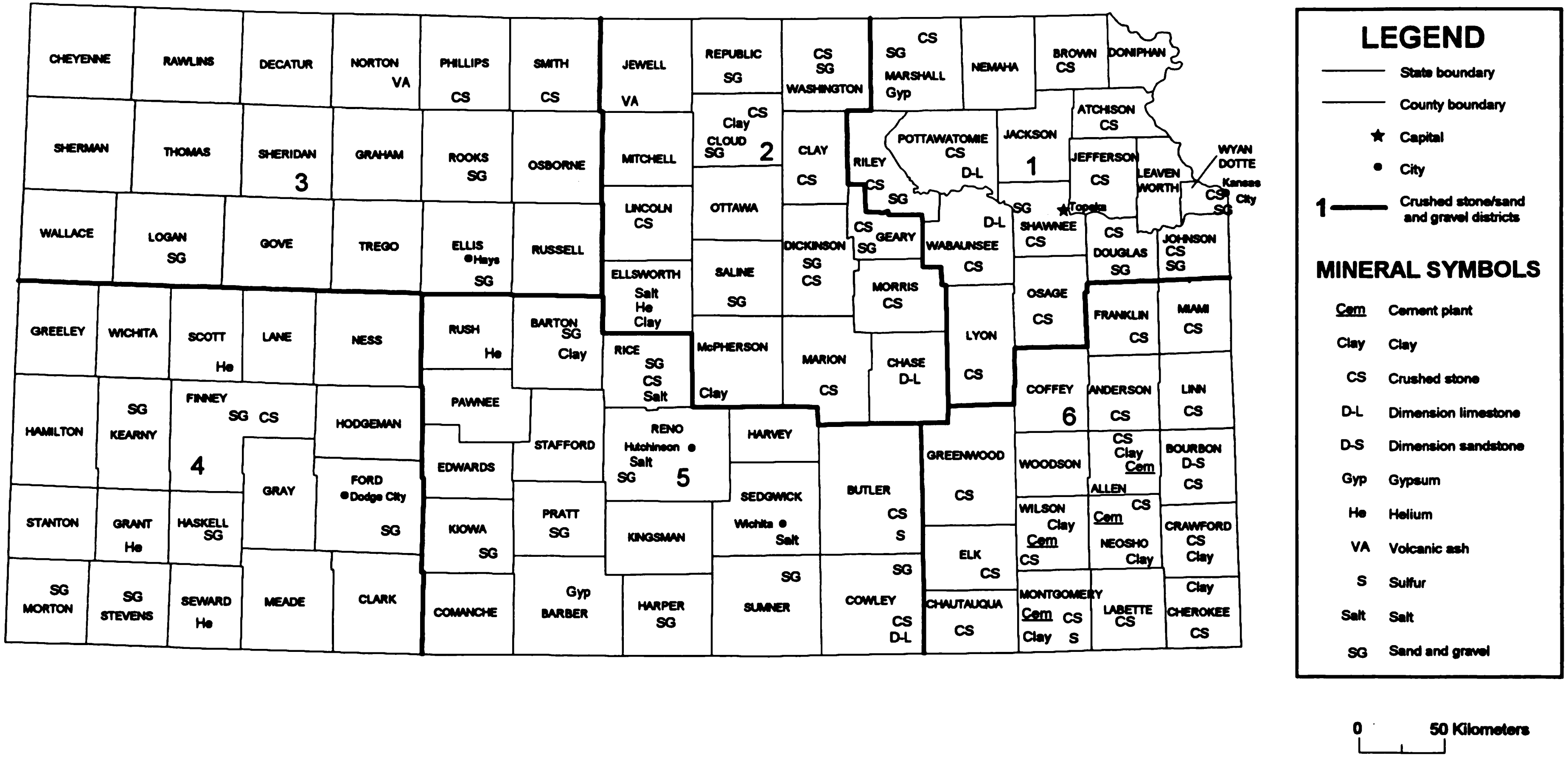
2/ Includes plaster and gunite sands.

3/ Includes fill, road and other stabilization (cement and lime).

4/ Includes filtration, railroad ballast, and roofing granules.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

KANSAS



Source: Kansas Geological Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF KANSAS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Kansas Geological Survey for collecting information on all nonfuel minerals.

In 1996, Kansas moved up three places in rank from 27th to 24th among the 50 States in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $524 million, a 5% increase from that of 1995. This followed a marginal increase from 1994 to 1995 (based on final 1995 data). The State accounted for about 1.4% of the U.S. total nonfuel mineral production value.

Portland cement, grade-A helium, and crushed stone were Kansas' leading nonfuel mineral commodities accounting for about 25%, 21%, and 20%, respectively, of the State's total nonfuel mineral production value. Salt followed close behind with about 18% of the value. In 1996, a substantial decrease in the value of salt was more than balanced out by a nearly $21 million increase in portland cement *(see table 1)*. The increase in portland cement combined with more moderate increases in crushed stone and construction sand and gravel accounted for the large majority of the State's overall increase in nonfuel mineral value. Other nonfuel mineral values that increased in 1996 were: grade-A and crude helium, industrial sand and gravel, crude gypsum, masonry cement, common clays, and dimension stone. In addition to salt, other nonfuel mineral commodities that decreased in value in 1996 were fuller's earth clays and pumice and pumicite. In 1995, increases in portland cement and salt slightly more than equaled decreases in crude helium and crushed stone, resulting in a marginal increase for the year.

Production of nonfuel minerals in Kansas consisted entirely of industrial minerals; no metals were mined in the State. Based on USGS estimates of the quantities produced in 1996 in the 50 States, Kansas continued as the Nation's leading producer of crude and grade-A helium and remained fifth in salt production. Significant quantities of portland cement, crushed stone, construction and industrial sand and gravel, crude gypsum, and common clays were produced in the State.

The following narrative information was provided by the Kansas Geological Survey[2] (KGS). A number of mergers and acquisitions occurred during 1996; the KGS reported that the competitive nature of the aggregate business in its State was a driving factor for these business transactions. Hunt-Midwest Corp., headquartered in the Kansas City, MO, area continued expanding its market in Kansas by acquiring McAdam Construction Co. and McAdam Limestone Co., both in Allen County. The Walter Keeler Co. of Wichita, Sedgewick County, announced in November that it had sold its sand and gravel assets to Allen's Concrete, also in Wichita. Allen is a division of the Ritchie Corp. Martin Marietta Corp. acquired both Criqui Limestone Co. in Osage County and Service Mining Co. The latter company, located in Oklahoma, had one quarry in Cowley County, Kansas.

The major industrial mineral news during the year involved the sand and gravel industry, in particular dredging on sections of the Kansas River. Environmental and recreational groups were attempting to establish a recreational corridor and effectively ban dredging in portions of the river. The main area being considered appeared to be the section of the river between Topeka and Lawrence. Here, a proposal to place a 2-year moratorium on any new operations was introduced but failed to have the required legislative support. However, the Kansas legislature did ask for a study to delineate potential corridor areas. Several State agencies were specifically named to the study group including the KGS. The U.S. Army Corps of Engineers currently reviews all proposed dredging permits in the river. Following approximately 2 years of debate, a permit to produce sand and gravel dredging at a location between Topeka and Lawrence was denied by the Corps. The Corps, however, did approve dredging permits for a location on the Republican River, another on the Walnut River near Wichita, and a gravel bar excavation on the Neosho River.

Numerous articles concerning dredging in the Kansas River appeared in the State's newspapers[3] during the year. Two articles included information about the poor water quality of the river and dredging, but did not recognize that the poor quality in the specified areas was directly related to runoff of the agricultural chemicals from farmland adjacent to the river. Also stated was the fact that dredging stirs up the river bed and releases adsorbed toxic chemicals. While this is true, the Kansas River sand, according to the KGS, is relatively free from clay minerals that have the capability to adsorb these chemicals. A team of scientists from the KGS began the planning process for a formal study of the problem from a variety of perspectives. KGS felt that the study was necessary because of the advantages of dredging on the river as compared with relative costs for river dredging versus floodplain dredging; the locations of reserves; area demand for sand and gravel including population growth in the area; and other related topics. To be implemented in the first half of 1997, completion of the study is expected by yearend.

A major, multi year program at the KGS is the remapping of much of the geology in the State. During the year, several new county surface geology maps were issued including those for the county's of Elk (M-49), Ellis (revised from 1988 M-19 version), Montgomery (M-44), Ness (M-47), Russell (M-37), and Stafford (M-46). These maps are available through the publications and sales office of the KGS. The mapping is being done using previously collected data in combination with current fieldwork. A related and free publication, *Geological Mapping in Kansas*, was released as Public Information Circular 4. Additionally, the publication *Surficial Geology and Stratigraphy of Russell County, Kansas,* was issued as Technical Series 7.

Other new and available publications of interest related to industrial minerals include: Open File: *Distribution and Thickness of the Cimarron Salt in Southern Stafford and Northern Pratt Counties* (11 p); and Educational Series 11: *Wichita's Building Blocks - A Guide to Building Stones and Geologic Features* (32 p).

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement) estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] David A. Grisafe, Industrial Minerals Specialist with the Kansas Geological Survey authored the text of minerals industry information submitted by that agency.

[3] For more specific information or references contact Mr. David A. Grisafe at the Kansas Geological Survey.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN KANSAS 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	24	2,090	31	2,650	32	2,710
Portland	1,640	101,000	1,730	109,000	2,050	129,000
Clays 3/	556	2,150	620	2,390	656	2,490
Gemstones	NA	W	NA	W	NA	1
Helium:						
Crude million cubic meters	32	31,400	30	26,600	30	27,200
Grade-A do.	53	105,000	53	105,000	54	108,000
Salt	2,660	108,000	2,770	113,000	2,710	93,000
Sand and gravel (construction)	11,200	29,600	11,100	29,400	13,500	38,500
Stone:						
Crushed	21,500	103,000	20,400	95,800	22,200	106,000
Dimension 4/ metric tons	23,700	1,730	19,800	1,810	20,400	2,140
Combined value of clays (fuller's earth), gypsum (crude), pumice and pumicite, sand and gravel (industrial), stone (dimension sandstone), and values indicated by symbol W	XX	11,900	XX	12,200	XX	15,200
Total	XX	497,000	XX	498,000	XX	524,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value" figure.

4/ Excludes certain stones; kind and value included with "Combined value" figure.

TABLE 2
KANSAS: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	W	W	$4.75
Riprap and jetty stone	59	$469	7.95
Filter stone	281	1,560	5.57
Other coarse aggregate	154	903	5.86
Coarse aggregate, graded:			
Concrete aggregate, coarse	970	6,060	6.25
Bituminous aggregate, coarse	703	4,650	6.61
Bituminous surface-treatment aggregate	W	W	6.30
Other graded coarse aggregate	60	353	5.88
Fine aggregate (-3/8 inch):			
Stone sand, concrete	W	W	5.00
Stone sand, bituminous mix or seal	W	W	2.77
Screening, undesignated	214	622	2.91
Other fine aggregate	W	W	4.97
Coarse and fine aggregate:			
Graded road base or subbase	699	3,240	4.64
Unpaved road surfacing	1,200	5,370	4.46
Terrazzo and exposed aggregate	W	W	4.46
Crusher run or fill or waste	402	1,820	4.52
Other construction materials 3/.	755	4,030	5.33
Agricultural:			
Agricultural limestone	174	724	4.16
Other agricultural uses	2	9	4.50
Chemical and metallurgical: Cement manufacture	2,040	7,280	3.57
Other specified uses not listed	81	604	7.46
Unspecified: 4/			
Actual	8,440	38,900	4.62
Estimated	4,180	19,200	4.59
Total	20,400	95,800	4.69

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Includes limestone, limestone-dolomite, sandstone and quartzite.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes roofing granules and waste material.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
KANSAS: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994				1995			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	112 r/	20,900 r/	$101,000 r/	$4.83	109 2/	20,400 2/	$95,600 2/	$4.69 2/
Limestone-dolomite	2	W	W	5.06	--	--	--	--
Sandstone	--	--	--	--	1	W	W	4.39
Quartzite	2	W	W	5.04	1	W	W	5.06
Total	XX	21,500	103,000	4.79	XX	20,400	95,800	4.69

r/ Revised. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes "limestone-dolomite," reported with no distinction between the two.

TABLE 4
KANSAS: CRUSHED STONE 1/ 2/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 3/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 4/	W	W	140	823	--	--	W	W
Coarse aggregate, graded 5/	840	5,710	W	W	--	--	W	W
Fine aggregate (-3/8 inch) 6/	W	W	W	W	--	--	W	W
Coarse and fine aggregate 7/	553	3,090	691	3,270	215	323	885	3,920
Other construction materials 8/	243	1,350	389	2,600	--	--	1,550	7,970
Agricultural 9/	(10/)	(10/)	(10/)	(10/)	--	--	68	343
Chemical and metallurgical 11/	--	--	--	--	--	--	2,040	7,280
Other miscellaneous uses 12/	81	604	--	--	--	--	--	--
Unspecified: 13/								
Actual	(10/)	(10/)	(10/)	(10/)	--	--	2,220	8,620
Estimated	1,520	7,510	--	--	--	--	2,660	11,700
Total	7,670	41,600	3,120	14,100	215	323	9,410	39,800

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ No crushed stone was produced in District 4.

2/ Production reported in District 5 was included with "District 6" to avoid disclosing company proprietary data.

3/ Data are rounded to three significant digits; may not add to totals shown.

4/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

5/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, and other graded coarse aggregate.

6/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

7/ Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), and terrazzo and exposed aggregate.

8/ Includes roofing granules and waste material.

9/ Includes agricultural limestone and other agricultural uses.

10/ Withheld to avoid disclosing company proprietary data; included in "Total."

11/ Includes cement manufacture.

12/ Includes other specified uses not listed.

13/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
KANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	2,000	$5,820	$2.91
Plaster and gunite sands	35	98	2.80
Concrete products (blocks, bricks, pipe, decorative, etc.)	75	255	3.40
Asphaltic concrete aggregates and other bituminous mixtures	668	2,250	3.37
Road base and coverings 2/	2,390	5,600	2.34
Fill	973	2,160	2.21
Snow and ice control	55	165	3.00
Other 3/	16	83	5.19
Unspecified: 4/			
Actual	2,700	6,910	2.56
Estimated	2,180	6,100	2.80
Total or average	11,100	29,400	2.65

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement and lime).

3/ Includes filtration, railroad ballast, and roofing granules.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
KANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	715	2,030	485	1,650	(3/)	(3/)
Asphaltic concrete aggregates and road base materials 4/	402	1,130	645	2,040	802	1,630
Other miscellaneous uses 5/	19	66	(3/)	(3/)	(3/)	(3/)
Unspecified: 6/						
Actual	717	1,840	--	--	13	34
Estimated	939	2,550	(3/)	(3/)	--	--
Total	2,790	7,620	1,280	4,190	877	1,840

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	349	1,020	507	1,330	(3/)	(3/)
Asphaltic concrete aggregates and road base materials 4/	1,140	2,740	994	2,330	53	133
Other miscellaneous uses 5/	12	63	16	45	--	--
Unspecified: 6/						
Actual	--	--	1,970	5,040	--	--
Estimated	282	682	767	2,120	(3/) 7/	(3/) 7/
Total	1,780	4,510	4,250	10,900	104 7/	416 7/

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

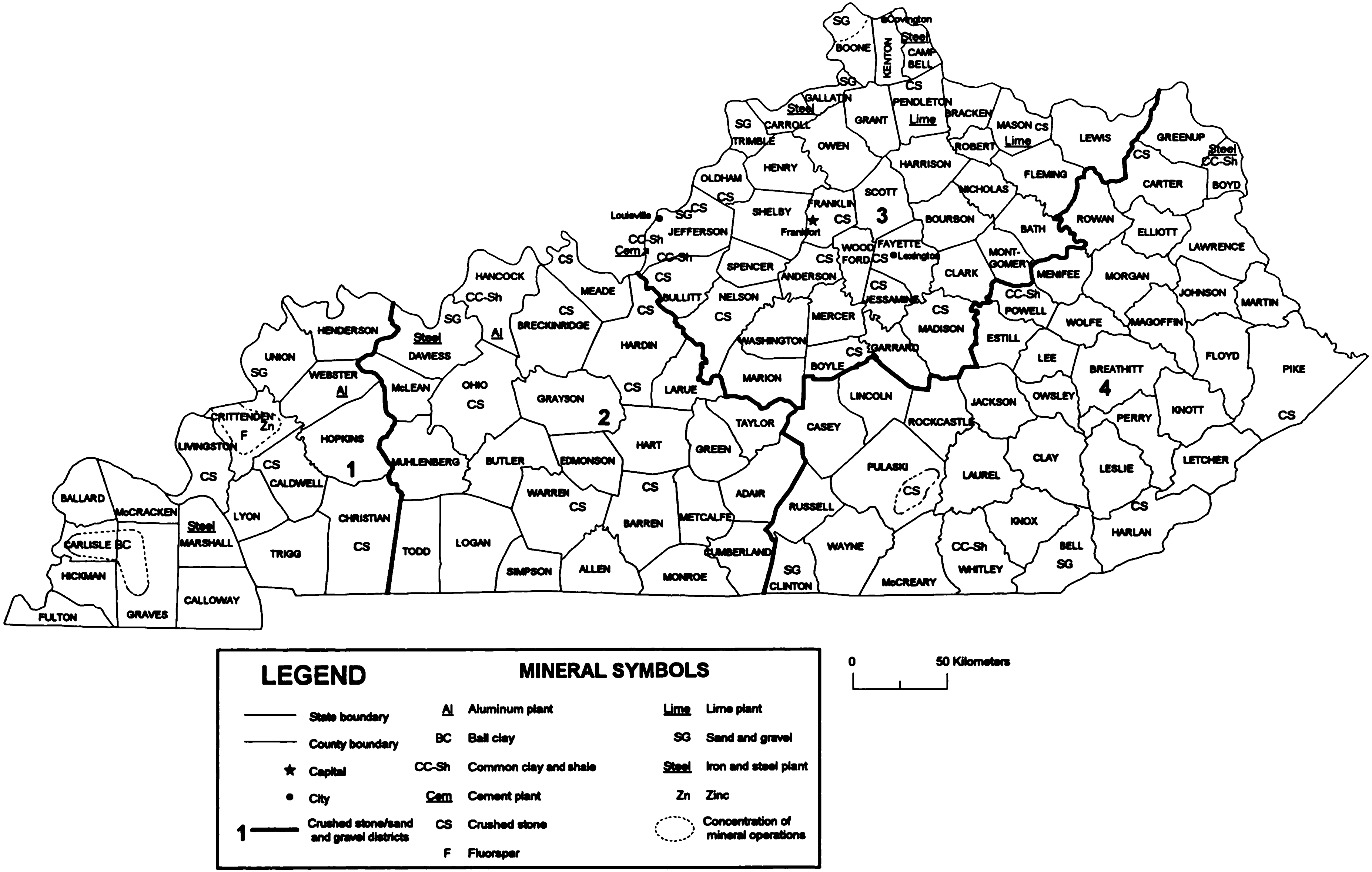
4/ Includes fill, and road and other stabilization (cement and lime).

5/ Includes filtration, railroad ballast, roofing granules, and snow and ice control.

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

7/ Includes unspecified within all districts.

KENTUCKY



Source: Kentucky Geological Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF KENTUCKY

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Kentucky Geological Survey for collecting information on all nonfuel minerals.

In 1996, Kentucky rose in rank from 32d to 30th among the 50 States in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $453 million, a 6.3% increase from that of 1995. This followed a slight decrease from 1994 to 1995 (based on final 1995 data). In 1996, Kentucky reached the highest nonfuel mineral value reported in the State's history. This was the fourth time in the last five years that the State surpassed the $400 million mark. The State accounted for more than 1% of the U.S. total nonfuel mineral production value.

Crushed stone continued as Kentucky's leading nonfuel mineral commodity in 1996, accounting for an estimated 58% of the State's nonfuel mineral production value. Lime was second and portland cement was third. In recent years, Kentucky has been entirely an industrial mineral-producing State. The last year in which any metal was mined in the State was 1990, when small quantities of zinc were mined. Kentucky's increase in nonfuel mineral value in 1996 resulted mostly from a $31 million, or about a 13%, increase in the value of crushed stone. Lime, gemstone, and clay values also increased. The State's overall increase was moderated by a $7 million decrease in construction sand and gravel value. Portland and masonry cements also showed small decreases in value. In 1995, a significant decrease in crushed stone value (of similar magnitude to the commodity's 1996 increase) plus a smaller decrease in gemstones were nearly balanced out by significant increases in the values of lime and portland cement together with a smaller increase in ball clay.

Compared with USGS estimates of the quantities produced in the other 49 States during 1996, Kentucky remained second in ball clays and one of the top four lime-producing States. By value, the State was seventh in gemstones. In addition, the State produced significant quantities of common clays. Primary aluminum and raw steel were produced from materials obtained from other domestic and foreign sources. Kentucky remained the Nation's second leading producer of primary aluminum with an estimated increase in production of nearly 2.5% from that of 1995.

The following narrative information was provided by the Kentucky Geological Survey (KGS).[2] Silverspar Minerals Inc. signed an option agreement with USX Corp. to purchase certain fluorspar properties in Kentucky and Illinois. The term of the option was for 2 months. Under the agreement, Silverspar/Orbex Resources ran a 2-month fluorspar production test run at the Babb-Barnes flotation mill located near Salem, KY. The mill operated during May and June, processing fluorspar purchased from the National Defense Stockpile. Silverspar's option expired and the flotation mill was shut down after the test run.

Dravo Lime Co. announced commencement of construction of its 330,000-metric-ton-per-year capacity expansion at its Maysville Division in Maysville. Fabrication and field erection stages started in mid-1996, and the new Kennedy Van Saun preheater rotary kiln was scheduled for startup during the second quarter of 1997. Sales of the flue gas desulfurization (FGD) lime from Dravo's two Kentucky lime plants were negatively impacted in 1996 by outages experienced at the General Gavin Station in Ohio and reduced usage by some of its other utility customers. The company expected its FGD sales to be only nominally up for the year.

A Lexington businessman sought a permit from the planning and zoning commission to construct an $18 million limestone mine in Wilder County. Six surface hectares of land were to be purchased for the operation from Newport Steel Corp. along with a lease for the company's underground rights.

The Rogers Group, Inc., of Louisville, KY, submitted plans to convert a former underground limestone mine, operated by the Oldham County Stone Co., into a climate-controlled business center called StrataSpace. As much as 3.25 hectares of the cavern, the size of about seven football fields, would be converted for the purpose of storing and managing computer records and paper files. Before the project can proceed, however, the company must get 4.5 hectares along one edge of the quarry rezoned from residential and agricultural to light industrial. Mining was to continue at the mine, but away from the business center.

Kentucky Solite Corp., a manufacturer of lightweight aggregate for the construction industry, closed its doors after 43 years because of a lack of business.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. Construction sand and gravel and crushed stone estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Garland Dever, Geologist, submitted the information provided by the KGS..

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN KENTUCKY 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

	1994		1995		1996 p/	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays	820 3/	3,460 3/	904	3,430 3/	897	4,000 3/
Sand and gravel (construction)	9,140	32,200	8,710	31,700	7,000	24,500
Stone (crushed)	56,300	259,000	54,700 4/	230,000 4/	60,000 4/	261,000 4/
Combined value of cement, clays (ball), gemstones, lime, and stone [crushed (1995), crushed dolomite and sandstone (1996)]	XX	134,000	XX	161,000	XX	164,000
Total	XX	428,000	XX	426,000	XX	453,000

p/ Preliminary. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value" data.

4/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
KENTUCKY: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	256	$867	$3.39
Riprap and jetty stone	3,720	14,000	3.76
Filter stone	585	3,010	5.14
Other coarse aggregate	640	2,880	4.49
Coarse aggregate, graded:			
Concrete aggregate, coarse	3,850	18,200	4.73
Bituminous aggregate, coarse	3,400	18,300	5.37
Bituminous surface-treatment aggregate	1,580	8,560	5.41
Railroad ballast	492	2,610	5.29
Other graded coarse aggregate	1,560	7,350	4.70
Fine aggregate (-3/8 inch):			
Stone sand, concrete	W	W	5.97
Stone sand, bituminous mix or seal	1,930	8,080	4.20
Screening, undesignated	779	3,760	4.83
Other fine aggregate	386	1,600	3.87
Coarse and fine aggregate:			
Graded road base or subbase	5,340	25,700	4.81
Unpaved road surfacing	2,000	8,540	4.26
Terrazzo and exposed aggregate	W	W	5.56
Crusher run or fill or waste	821	3,620	4.41
Other coarse and fine aggregate	771	3,370	4.37
Other construction materials	361	1,700	4.72
Agricultural:			
Agricultural limestone	1,050	4,670	4.44
Poultry grit and mineral food	7	119	17.00
Other agricultural uses	3	36	12.00
Chemical and metallurgical:			
Cement manufacture	(3/)	(3/)	2.52
Lime manufacture	(3/)	(3/)	1.10
Flux stone	(3/)	(3/)	2.86
Sulfur oxide removal	(3/)	(3/)	13.10
Special:			
Mine dusting or acid water treatment	(3/)	(3/)	7.65
Other fillers or extenders	86	903	10.50
Other specified uses not listed	(3/)	(3/)	4.41
Unspecified: 4/			
Actual	12,300	52,300	4.27
Estimated	6,550	27,600	4.21
Total	54,700	230,000	4.20

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Includes limestone.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Includes production reported without a breakdown by end use and estimates for norespondents.

TABLE 3
KENTUCKY: CRUSHED STONE SOLD OR USED BY PRODUCERS, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	88	53,600	$246,000	$4.58 r/	89	54,700	$230,000	$4.20
Limestone-dolomite	3	W	W	4.86	--	--	--	--
Sandstone	1	W	W	9.04	--	--	--	--
Total	XX	56,200 r/	259,000	4.61	XX	54,700	230,000	4.20

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 4
KENTUCKY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 2/	(3/)	(3/)	(3/)	(3/)	458	2,540	760	3,760
Coarse aggregate, graded 4/	(3/)	(3/)	(3/)	(3/)	3,280	18,900	2,970	14,200
Fine aggregate (-3/8 inch) 5/	(3/)	(3/)	(3/)	(3/)	830	4,120	824	3,720
Coarse and fine aggregate 6/	(3/)	(3/)	(3/)	(3/)	2,900	15,700	2,440	11,100
Agricultural 7/	(3/)	(3/)	(3/)	(3/)	204	1,020	123	585
Chemical and metallurgical 8/	--	--	(3/)	(3/)	(3/)	(3/)	--	--
Special 9/	(3/)	(3/)	--	--	(3/)	(3/)	--	--
Unspecified: 10/								
Actual	5,050	17,100	2,420	12,900	4,060	18,700	720	3,590
Estimated	130	555	1,960	8,350	2,190	7,840	2,280	10,800
Total	16,300	64,900	9,260	39,700	19,000	77,400	10,100	47,700

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, crusher run (select material or fill), other coarse and fine aggregates and other construction materials.

7/ Includes agricultural limestone, poultry grit and material food, and other agricultural uses.

8/ Includes cement manufacture, flux stone, lime manufacture, and sulfur oxide removal.

9/ Includes mine dusting or acid water treatment, other fillers or extenders, and other specified uses not listed.

10/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
KENTUCKY: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	1,730	$6,060	$3.51
Concrete products (blocks, bricks, pipe, decorative, etc.)	158	523	3.31
Asphaltic concrete aggregates and other bituminous mixtures	876	3,070	3.50
Road base and coverings 2/	123	655	5.33
Fill	723	1,350	1.87
Other 3/	49	167	3.41
Unspecified: 4/			
Actual	4,410	17,000	3.86
Estimated	644	2,800	4.35
Total or average	8,710	31,700	3.63

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Includes snow and ice control.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
KENTUCKY: CONSTRUCTION SAND AND GRAVEL 1/ SOLD OR USED IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products	(3/)	(3/)	529	1,950	(3/)	(3/)
Asphaltic concrete aggregates and road base materials 4/	138	473	249	1,150	1,340	3,460
Other miscellaneous uses 5/	(3/)	(3/)	--	--	(3/)	(3/)
Unspecified: 6/						
Actual	--	--	--	--	4,410	17,000
Estimated	519	1,980	--	--	125	823
Total	1,400	4,790	778	3,100	6,530	23,800

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Production reported in District 4 was included with "District 3" to avoid disclosing company proprietary data.

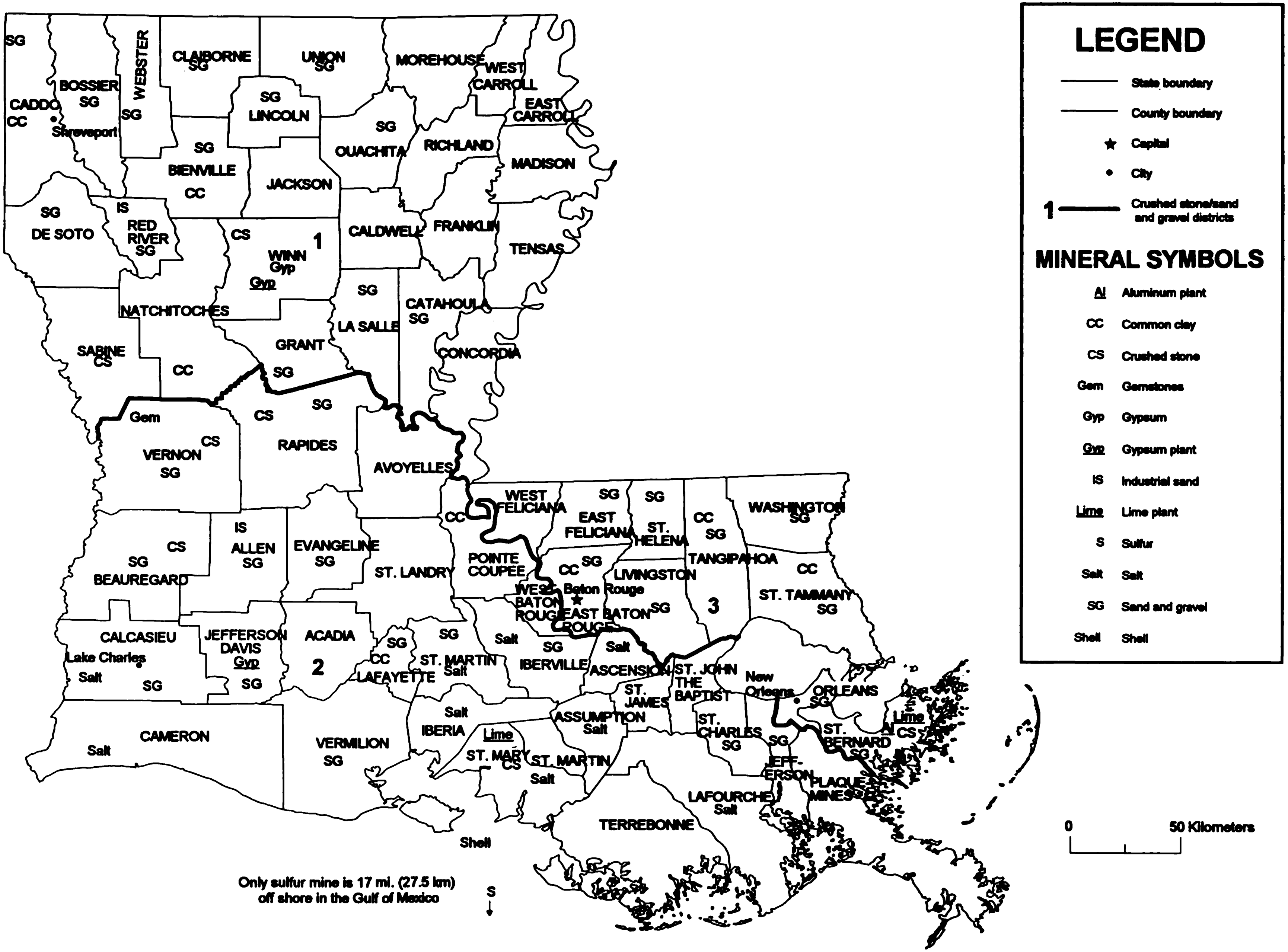
3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Includes fill, and road and other stabilization (cement).

5/ Includes snow and ice control.

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

LOUISIANA



Only sulfur mine is 17 mi. (27.5 km) off shore in the Gulf of Mexico

Source: Louisiana Geological Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF LOUISIANA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Louisiana Geological Survey for collecting information on all nonfuel minerals.

In 1996, Louisiana remained 31st in the Nation in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $428 million, about a 1% decrease from that of 1995. This followed nearly a 23% increase from 1994 to 1995 (based on final 1995 data). The State accounted for more than 1% of the U.S. total nonfuel mineral production value.

Louisiana's leading nonfuel mineral is salt, accounting for about 44% of the State's nonfuel mineral value in 1996. When included as part of Louisiana's mineral production, sulfur is the State's second-leading mineral commodity. All current sulfur production comes from a mine 27 kilometers off the Louisiana coast. Because of the mine's location, the State does not receive severance tax income or mineral production royalties; instead, they are collected by the Federal Government. Consequently, the State and the Louisiana Geological Survey (LGS) do not consider the sulfur production cited in table 1 under "Combined value" as being part of Louisiana's nonfuel mineral production. This has been the case since 1991. The USGS attributes this offshore sulfur production to Louisiana because it is the State nearest to the sulfur mine and Freeport Sulphur Co., the company that operates the mine, is based in New Orleans.

In 1996, decreased sulfur production value more than offset increases in other nonfuel mineral commodities, resulting in the net drop for the State. The increased values of salt, sulfur, and crushed stone accounted for most of the State's substantial rise in value in 1995. Compared with 1995, the mineral commodity values that increased in 1996 were those of salt, crushed stone, construction sand and gravel, and lime. Common clays, crude gypsum, and gemstones each showed small decreases.

Based on USGS estimates of the quantities produced in the 50 States during 1996, Louisiana remained the leading State in the Nation in salt and sulfur production. Additionally, significant quantities of construction and industrial sand and gravel and common clays were produced in the State.

The following narrative information was provided by the LGS.[2] Recent cracks in the salt domes of the Strategic Petroleum Reserve facility at Weeks Island led U.S. Department of Energy (DOE) officials to initiate the removal of the contained oil. A Houston-based company, Sofregaz, has been awarded the contract by the DOE to produce the brine that will be needed to fill the crude oil storage cavern once the oil is transferred out. Sofregaz wants to drill a 1,370-meter well into a Morton Salt Co. dome to produce enough brine water to fill the empty cavern that will be created. Fresh water for salt cavern development would be obtained from the Intercoastal Waterway and transported to the injection well by a proposed, 51-centimeter above-ground pipe.

On November 20, 1980, the Jefferson Island underground rock salt mine was permanently lost to water from overlying Lake Peigner. In February 1996, the Louisiana Department of Natural Resources issued a permit to a Houston company, Equitable Storage Inc., to stockpile gas in the cavern beneath Lake Peigner. The work on the storage facility was completed.

K M Iron of Japan, HBI of Japan, and C.S. Industries Inc. have announced their intention to build new iron production plants in the State and are applying for 10-year industrial tax exemptions. These three facilities will total $600 million in capital investment.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. Construction sand and gravel and crushed stone estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Syed M. Haque, Physical Scientist at the LGS, authored the text of Louisiana minerals industry information submitted by the LGS.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN LOUISIANA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays	371	3,280	384	548	395	530
Gemstones	NA	155	NA	175	NA	W
Salt	13,500	140,000	14,700	177,000	15,000	189,000
Sand and gravel:						
Construction	12,300	49,600	11,300	50,200	11,600	51,600
Industrial	454	9,320	572	10,500	572	10,500
Stone (crushed) 3/	707	7,710	2,540	26,700	3,100	31,300
Combined value of gypsum (crude), lime, stone (crushed shell and miscellaneous), sulfur (frasch), and value indicated by symbol W	XX	144,000	XX	169,000	XX	145,000
Total	XX	354,000	XX	434,000	XX	428,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
LOUISIANA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction aggregates: 3/	119	$1,070	$8.98
Special: Asphalt fillers or extenders	W	W	4.56
Unspecified: 4/			
Actual	W	W	10.79
Estimated	449	4,940	11.01
Total	2,540	26,700	10.50

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Includes sandstone; excludes miscellaneous stone and shell from State total to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), and stone sand (bituminous mix or seal).

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
LOUISIANA: CRUSHED STONE SOLD OR USED, BY KIND 1/ 2/

Kind	1994				1995			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Sandstone	6	707	$7,710	$10.91	16	2,540	$26,700	$10.51

1/ Data are rounded to three significant digits.

2/ Excludes miscellaneous stone and shell from State total to avoid disclosing company proprietary data.

TABLE 4
LOUISIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand) 2/	2,540	$13,000	$5.13
Asphaltic concrete aggregates and other bituminous mixtures	640	2,950	4.62
Road base and coverings	449	1,770	3.94
Fill	1,060	1,980	1.86
Unspecified: 3/			
Actual	4,080	18,600	4.55
Estimated	2,570	11,900	4.63
Total or average	11,300	50,200	4.43

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
LOUISIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	700	4,150	401	2,990	1,440	5,880
Asphaltic concrete aggregates and road base materials 3/	133	539	533	1,330	1,480	4,830
Unspecified: 4/						
Actual	189	1,080	1,420	6,480	2,480	11,000
Estimated	77	372	916	4,310	1,570	7,200
Total	1,100	6,150	3,270	15,100	6,970	28,900

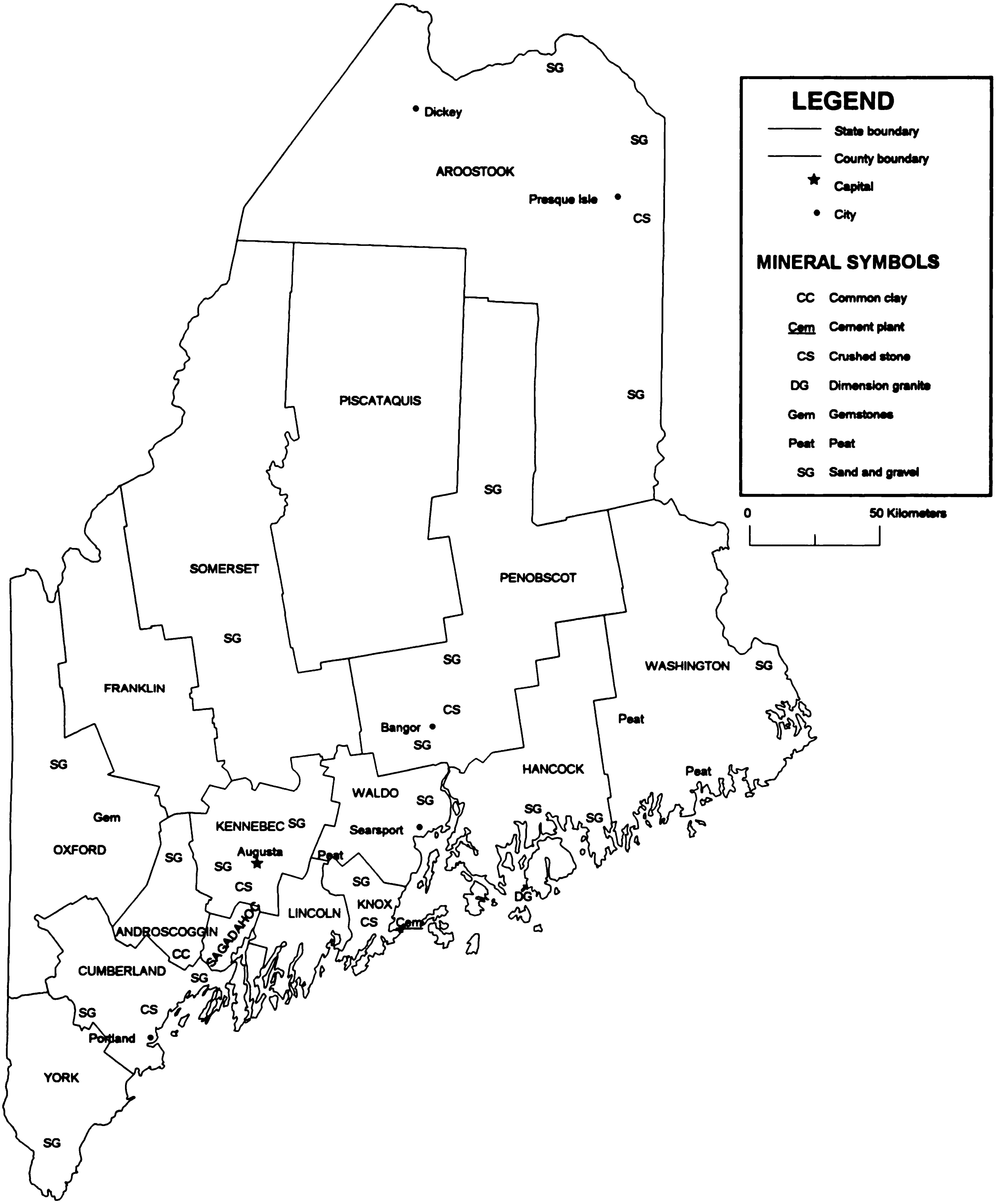
1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes fill.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

MAINE



Source: Maine Geological Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF MAINE

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Maine Geological Survey for collecting information on all nonfuel minerals.

In 1996, for the fourth consecutive year, Maine ranked 45th in the Nation in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $73 million, an 8% increase from that of 1995. This followed nearly an 11% increase from 1994 to 1995. The State accounted for somewhat less than 0.5% of the U.S. total nonfuel mineral production value. Maine's increased nonfuel mineral value in 1996 resulted from the rise in value of construction sand and gravel and, less so, that of crushed stone. Dimension stone (granite) also increased but by a relatively small amount. Decreases occurred for portland and masonry cements, peat, and gemstones. In 1995 the mineral commodities responsible for the State's overall increase were portland cement and construction sand and gravel.

The following narrative information was provided by the Maine Geological Survey[2] (MGS). According to the MGS, one of the most significant events in Maine's mining industry in 1996 was a proposal by NNM Resources Inc., a wholly owned company of Black Hawk Mining Inc., to open a mine at the Bald Mountain polymetallic deposit in Aroostook County. The Bald Mountain deposit, about 35 miles west of Presque Isle, consists of four zones: a gold-silver gossan, a high-grade supergene copper zone, a primary copper zone, and a low-grade zinc zone. While companies previously have designed projects to mine the whole deposit, the current Black Hawk proposal is for a much more limited project—to only extract gold and silver from the gossan cap. The gossan zone contains 1.1 million metric tons grading 4.1 grams (0.132 troy ounces) per ton gold and 91 grams (2.94 troy ounces) per ton silver. Environmental baseline monitoring was underway in 1996 and formal mining application was expected in 1997. This would be the first application submitted to the State of Maine under mining rules adopted in 1991.

Exploration for base metals in Maine both to evaluate known deposits and prospect for new ones continued in 1996 at a modest level. Several base metal deposits identified in previous exploration efforts have yet to be developed. One prominent reason for this is that on the international market, the Maine deposits are either of inadequate tonnage or grade to compete with mines elsewhere in the world. Another factor considered by the MGS to be limiting interest in these properties was that the re-opening or expanding of existing mines elsewhere was preferred over opening new mine sites in Maine. Most notably, the record-breaking mining production in New Brunswick, Canada, in 1995 had no direct spinoff effect in Maine, and diverted resources of some regional mining offices away from Maine to New Brunswick. A team from the Mineral Resource Program of the USGS began a reconnaissance field and geochemical study of volcanic rocks hosting the Bald Mountain and Mt. Chase deposits of northern Maine.

The development permit for the Alder Pond copper-zinc-lead deposit in Somerset County, northwestern Maine, was transferred from BHP Minerals International, by way of an option agreement to the GCO Minerals Co. at the end of 1996. Under this permit, GCO Minerals engaged the drilling services of Prospectors Alliance Ltd. Prospectors Alliance, in partnership with yet another company, Larder Minerals Co. began a step-out drilling program adjacent to the Alder Pond main mineralized zone.

Interest in Maine gems among both amateur and professional collectors remained strong in 1996. Activity in several known pegmatite bodies in southern and southwestern Maine continued to produce gem tourmaline, amethyst, apatite, and other minerals. Maine pegmatites, which host the gems' major mineral pockets, were the subject of new petrologic research in 1996. In addition to the value of the gems produced, the mineral industry continues to attract mineral collectors and tourists to the State, thereby having a secondary beneficial impact on Maine's economy.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. Construction sand and gravel and crushed stone estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Henry Berry, Physical Geologist, authored the text of minerals industry information submitted by that agency.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MAINE 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones	NA	235	NA	305	NA	W
Peat	W	W	15 3/	845 3/	W	W
Sand and gravel (construction)	5,890	24,400	6,420	26,900	7,170	31,200
Stone (crushed)	2,740	15,500	3,110	16,100	3,300	17,300
Combined value of cement, clays (common), stone [dimension (1994), dimension granite (1995-96)], and values indicated by symbol W	XX	20,900	XX	23,500	XX	24,600
Total	XX	61,000	XX	67,600	XX	73,100

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicabl

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Data series changed to production beginning in 1995; prior years shipment data may not be comparable.

TABLE 2
MAINE: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	(3/)	$2	$7.35
Filter stone	79	358	4.53
Coarse aggregate, graded:			
Concrete aggregate, coarse	80	658	8.23
Bituminous aggregate, coarse	112	554	4.95
Railroad ballast	9	71	7.89
Fine aggregate (-3/8 inch): Screening, undesignated	5	19	3.80
Coarse and fine aggregate: Graded road base or subbase	191	840	4.40
Chemical and metallurgical:			
Cement manufacture	W	W	2.65
Lime manufacture	W	W	2.73
Unspecified: 4/			
Actual	772	4,740	6.14
Estimated	1,260	7,240	5.75
Total	3,110	16,100	5.17

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Includes calcareous marl, granite, limestone, miscellaneous stone, quartzite, slate, and traprock.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Less than 1/2 unit.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
MAINE: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994				1995			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	6	1,530	$9,450	$6.19	6	1,590	$7,910	$4.96
Calcareous marl	1	W	W	11.50	1	W	W	11.43
Granite	3	314	1,420	4.52	2	W	W	5.04
Quartzite	--	--	--	--	1	W	W	5.65
Slate	2	W	W	6.43	2	W	W	6.61
Traprock	2	W	W	5.28	2	W	W	5.52
Miscellaneous stone	2	198	750	3.79	4	W	W	4.70
Total	XX	2,740	15,500	5.65	XX	3,110	16,100	5.17

W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 4
MAINE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	609	$2,800	$4.60
Concrete products (blocks, bricks, pipe, decorative, etc.)	(2/)	1	6.80
Asphaltic concrete aggregates and other bituminous mixtures	944	4,820	5.11
Road base and coverings 3/	1,460	5,760	3.94
Fill	774	1,590	2.05
Snow and ice control	548	1,730	3.15
Other	54	102	1.89
Unspecified: 4/			
Actual	259	1,280	4.92
Estimated	1,770	8,800	4.97
Total or average	6,420	26,900	4.18

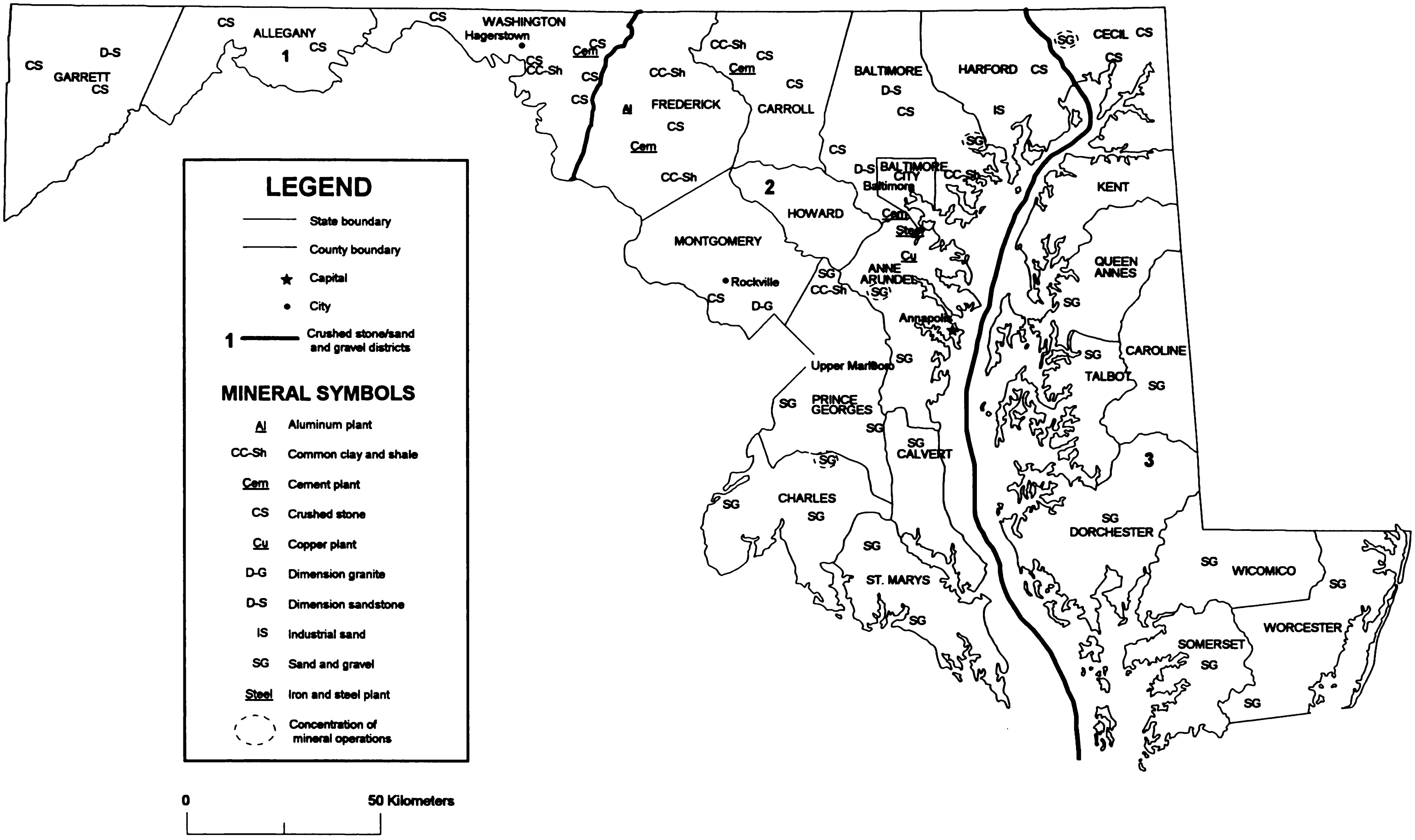
1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Less than 1/2 unit.

3/ Includes road and other stabilization (cement and lime).

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

MARYLAND



Source: Maryland Geological Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF MARYLAND

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Maryland Geological Survey for collecting information on all nonfuel minerals.

In 1996, Maryland remained 36th among the 50 States in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $324 million, virtually unchanged from that of 1995. The State's nonfuel mineral production value totals for 1995 and 1996, as represented in table 1, are artificially low because data have been withheld to avoid disclosing company proprietary data. Maryland's ranking in 1996 was not affected by the withholding of data, however, the State would have moved up one place in rank in 1995. The State accounted for almost 1% of the U.S. total nonfuel mineral production value.

Crushed stone remained Maryland's leading nonfuel mineral commodity. Based on the State's 1996 total nonfuel mineral value in table 1, crushed stone accounted for 50% of that total, followed by portland cement, 30%, and construction sand and gravel, 19%. Compared with that of 1995, mineral commodity values that increased in 1996 were those of crushed stone and construction sand and gravel. Decreases occurred for portland and masonry cements, dimension stone, and common clays.

Compared with USGS estimates of the quantities produced in the other 49 States during 1996, Maryland was third in masonry cement, following a ranking of first in 1995. Additionally, the State produced significant quantities of crushed stone, portland cement, and dimension stone. All nonfuel minerals mined in Maryland were industrial minerals. All metals production, in particular primary aluminum and raw steel, were processed from materials received from foreign and other domestic sources. Based on preliminary figures for both metals, Maryland was eighth in the Nation in the production of primary aluminum and one of the top eight raw steel-producing States.

The Maryland Department of the Environment[2] (MDE) reported that they had delineated "zones of influence" for four limestone quarries. A "zone of influence" is an area where, if private property damage is sustained, the person suffering the loss must be reimbursed for damages by the quarry operating within the zone's boundaries. The zones are based upon topography and historical data, on geologic and hydrogeologic factors, and potential effects to the area's wells. The quarry is initially presumed responsible in order to facilitate an immediate solution for the victim. For example, if a farmer loses a cow in a sinkhole because a quarry was pumping out ground water, the quarry is responsible for appropriately reimbursing the farmer for his loss. Later, the quarry can be relieved of responsibility if it can prove that it was not at fault. As part of the process, the MDE also seeks and obtains information from the quarry operators and public. MDE reported that public information meetings were held with a moderate response from the community. Efforts will continue in 1997 to produce 4 more of the planned total of 18 zones.

The year was rather quiet for the minerals industry. No new quarries were opened. Crushed stone and construction sand and gravel production followed the slowly increasing trend of the past several years.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (e.g., construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: http: minerals.er.usgs.gov/minerals/ contacts/comdir.html

[2] The following narrative information was submitted by Mr. C. Edmon Larrimore of the Maryland Department of the Environment.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MARYLAND 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994 Quantity	1994 Value	1995 Quantity	1995 Value	1996 p/ Quantity	1996 p/ Value
Cement (portland)	1,710	90,700	1,670	101,000	1,620	97,600
Clays	293	946	278	943	293	905
Gemstones	NA	1	NA	1	NA	1
Sand and gravel (construction)	8,920	61,200	9,700	61,700	9,750	62,400
Stone:						
Crushed	23,200 3/	157,000 3/	24,200	158,000	24,500	162,000
Dimension metric tons	18,800 3/	1,550 3/	20,700	2,260	11,100	1,190
Combined value of other industrial minerals	XX	29,000	XX	(4/)	XX	(4/)
Total	XX	340,000	XX	324,000 5/	XX	324,000 5/

p/ Preliminary. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain stones; kind and value included with "Combined value" data.

4/ Value excluded to avoid disclosing company proprietary data.

5/ Partial total, excludes values that must be concealed to avoid disclosing company proprietary data.

TABLE 2
MARYLAND: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch): Riprap and jetty stone 3/	991	$7,360	$7.43
Coarse aggregate, graded:			
Concrete aggregate, coarse	2,350	16,200	6.90
Bituminous aggregate, coarse	1,520	9,920	6.54
Bituminous surface-treatment aggregate	232	1,760	7.57
Railroad ballast	W	W	6.21
Fine aggregate (-3/8 inch): Stone sand, concrete 4/	1,440	9,970	6.92
Coarse and fine aggregates:			
Graded road base or subbase	1,520	9,760	6.44
Unpaved road surfacing	W	W	5.94
Terrazzo and exposed aggregate	W	W	7.87
Crusher run or fill or waste	1,990	12,600	6.33
Other coarse and fine aggregates	685	2,830	4.13
Agricultural: Agricultural limestone	(5/)	(5/)	7.75
Chemical and metallurgical: Cement manufacture	(5/)	(5/)	2.50
Special: Whiting or whiting substitute	209	18,400	88.26
Unspecified: 6/			
Actual	9,600	54,300	5.66
Estimated	1,580	9,490	6.00
Total	24,200	158,000	6.54

W Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

1/ Includes granite, limestone, marble, sandstone, and traprock.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone.

4/ Includes stone sand (bituminous mix or seal), and screening (undesignated).

5/ Withheld to avoid disclosing company proprietary data; included in "Total."

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
MARYLAND: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	19 r/	16,000 r/	$109,000 r/	$6.81 r/	19	15,500	$105,000	$6.79
Granite	4	4,940	31,600	6.40	4	4,960	29,400	5.93
Traprock	3	2,010	14,100	7.02	2	W	W	6.31
Marble	(2/)	(2/)	(2/)	(2/)	2	W	W	6.21
Sandstone	4	242	2,000	8.26	3	191	1,430	7.46
Miscellaneous stone	(2/)	(2/)	(2/)	(2/)	--	--	--	--
Total	XX	23,200 r/	157,000 r/	6.75 r/	XX	24,200	158,000	6.54

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Excludes marble and miscellaneous stone from State total to avoid disclosing company proprietary data.

TABLE 4
MARYLAND: CRUSHED STONE 1/ 2/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT

(Thousand metric tons and thousand dollars)

	District 1		District 2	
Use	Quantity	Value	Quantity	Value
Construction aggregates:				
Coarse aggregate (+1 1/2 inch) 3/	W	W	W	W
Coarse aggregate, graded 4/	W	W	W	W
Fine aggregate (-3/8 inch) 5/	W	W	W	W
Coarse and fine aggregate 6/	1,000	4,640	9,720	65,800
Agricultural 7/	--	--	(8/)	(8/)
Chemical and metallurgical 9/	--	--	(8/)	(8/)
Special 10/	--	--	209	18,400
Unspecified: 11/				
Actual	2,160	9,270	7,440	45,000
Estimated	--	--	1,580	9,490
Total	3,170	13,900	21,000	144,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregate."

1/ Production reported in District 3 was included with "District 2" to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone and riprap and jetty stone.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, and railroad ballast.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), and screening (undesignated).

6/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

7/ Includes agricultural limestone.

8/ Withheld to avoid disclosing company proprietary data; included in "Total."

9/ Includes cement manufacture.

10/ Includes whiting or whiting substitute.

11/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
MARYLAND: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	5,320	$34,100	$6.40
Plaster and gunite sands	145	1,110	7.67
Concrete products (blocks, bricks, pipe, decorative, etc.)	172	1,350	7.85
Asphaltic concrete aggregates and other bituminous mixtures	311	1,560	5.01
Road base and coverings 2/	473	3,620	7.65
Fill	510	1,670	3.28
Other 3/	54	524	9.70
Unspecified: 4/			
Actual	1,170	7,090	6.07
Estimated	1,540	10,700	6.93
Total or average	9,700	61,700	6.36

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (lime).

3/ Includes filtration, and snow and ice control.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
MARYLAND: CONSTRUCTION SAND AND GRAVEL 1/ SOLD OR USED IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

Use	District 2		District 3	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 3/	5,050	33,200	590	3,380
Asphaltic concrete aggregates and road base materials 4/	1,090	6,480	204	375
Other miscellaneous uses 5/	45	460	9	64
Unspecified: 6/				
Actual	1,170	7,090	--	--
Estimated	336	2,320	1,210	8,370
Total	7,690	49,500	2,010	12,200

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Production reported in District 1 was included with "District 2" to avoid disclosing company proprietary data.

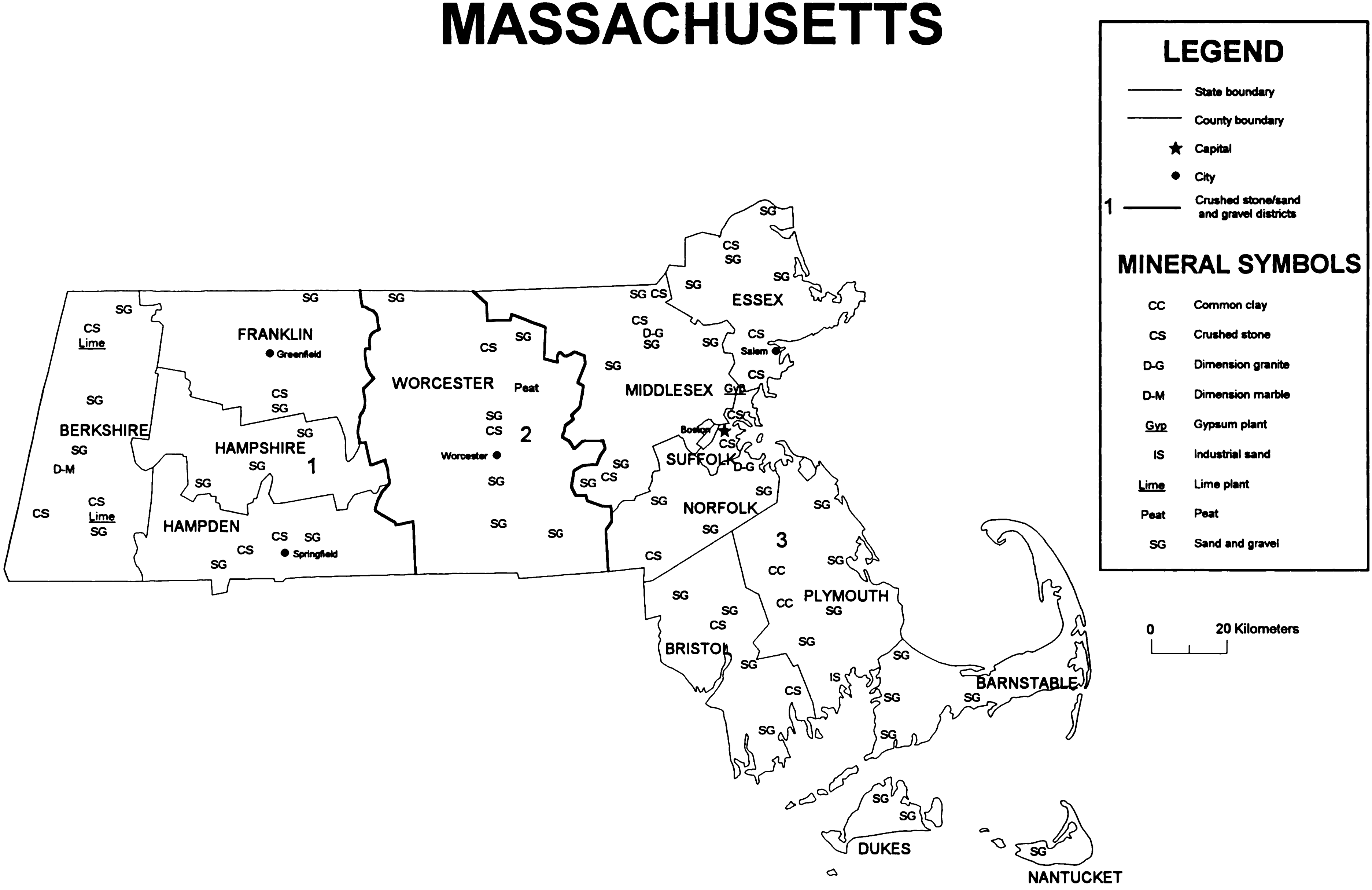
3/ Includes plaster and gunite sands.

4/ Includes fill, and road and other stabilization (lime).

5/ Includes filtration, and snow and ice control.

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

MASSACHUSETTS



Source: Massachusetts Executive Office of Environmental Affairs/U.S. Geological Survey

THE MINERAL INDUSTRY OF MASSACHUSETTS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Massachusetts Executive Office of Environmental Affairs for collecting information on all nonfuel minerals.

In 1996, for the second consecutive year, Massachusetts ranked 39th in the Nation in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $191 million, about a $1 million increase from that of 1995. This followed about a 7% increase from 1994 to 1995 (based on final 1995 data). The State accounted for about 0.5% of the U.S. total nonfuel mineral production value.

The leading mineral commodities by value in Massachusetts were construction sand and gravel and crushed stone, respectively. Dimension stone was third. The increases in construction sand and gravel and dimension stone values in 1996 a little more than compensated for a 17% decrease in crushed stone value. Additionally, lime and gemstone values showed small increases and peat decreased a small amount. In 1995, all three leading mineral commodities had gained in value, especially construction sand and gravel and dimension stone. Based on USGS estimates of quantities of dimension stone produced in the United States during 1995, Massachusetts increased in rank from fifth to fourth.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For construction sand and gravel and crushed stone estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MASSACHUSETTS 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays	W	W	31	W	31	W
Sand and gravel (construction)	12,300	60,000	11,700	67,500	13,500	81,000
Stone:						
Crushed	10,400 3/	96,800 3/	11,100	97,400	9,200	80,500
Dimension metric tons	57,300	9,600	77,600	14,600	121,000	18,800
Combined value of clays (common), gemstones, lime, peat, stone [crushed dolomite and limestone (1994)], and values indicated by symbol W	XX	11,100	XX	10,700	XX	10,800
Total	XX	178,000	XX	190,000	XX	191,000

p/ Preliminary. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
MASSACHUSETTS: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	57	$440	$7.72
Other coarse aggregate 3/	334	3,220	9.65
Coarse aggregate, graded:			
Concrete aggregate, coarse	502	3,090	6.16
Bituminous aggregate, coarse	1,610	12,300	7.65
Bituminous surface-treatment aggregate	773	7,780	10.07
Railroad ballast	451	2,690	5.95
Other graded coarse aggregate	W	W	11.79
Fine aggregate (-3/8 inch):			
Stone sand, concrete	112	736	6.57
Screening, undesignated	549	2,960	5.39
Other fine aggregate 4/	469	4,000	8.53
Coarse and fine aggregates:			
Graded road base or subbase	201	1,480	7.38
Crusher run or fill or waste	514	3,760	7.31
Other coarse and fine aggregates	W	W	13.21
Other construction materials 5/	1,610	19,100	11.87
Agricultural:			
Agricultural limestone	(6/)	(6/)	17.33
Poultry grit and mineral food	(6/)	(6/)	17.33
Chemical and metallurgical:			
Cement manufacture	(6/)	(6/)	1.08
Lime manufacture	(6/)	(6/)	6.92
Special:			
Asphalt fillers or extenders	(7/)	3	22.04
Other fillers or extenders	(6/)	(6/)	56.98
Unspecified: 8/			
Actual	130	1,130	8.66
Estimated	3,280	26,700	8.13
Total	11,100	97,400	8.77

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Includes dolomite, granite, limestone, limestone-dolomite, miscellaneous stone, and traprock.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone and macadam.

4/ Includes stone sand (bituminous mix or seal).

5/ Includes building products.

6/ Withheld to avoid disclosing company proprietary data; included in "Total."

7/ Less than 1/2 unit.

8/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
MASSACHUSETTS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1995, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	4 r/	1,660 r/	$18,500 r/	$11.19 r/	4	2,020	$21,800	$10.80
Limestone-dolomite	(2/)	(2/)	(2/)	(2/)	1	W	W	8.04
Dolomite	(2/)	(2/)	(2/)	(2/)	1	W	W	1.08
Granite	9 r/	2,890 r/	29,600 r/	10.23 r/	10	3,430	31,400	9.15
Traprock	20	5,860	48,700	8.31	16	5,450	42,500	7.78
Miscellaneous stone	--	--	--	--	2	W	W	9.20
Total	XX	10,400 r/	96,800 r/	9.30 r/	XX	11,100	97,400	8.77

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Excludes dolomite and limestone-dolomite from State total to avoid disclosing company proprietary data.

TABLE 4
MASSACHUSETTS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 2/	57	450	W	W	W	W
Coarse aggregate, graded 3/	W	W	W	W	W	W
Fine aggregate (-3/8 inch) 4/	W	W	43	138	W	W
Coarse and fine aggregate 5/	W	W	W	W	727	6,320
Other construction materials 6/	1,480	10,800	1,010	5,820	3,860	38,000
Agricultural 7/	(8/)	(8/)	--	--	--	--
Chemical and metallurgical 9/	(8/)	(8/)	--	--	--	--
Special 10/	(8/)	(8/)	(11/)	3	--	--
Unspecified: 12/						
Actual	--	--	--	--	130	1,130
Estimated	1,530	13,100	664	5,570	1,090	8,060
Total	3,590	32,400	1,710	11,500	5,810	53,500

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

5/ Includes graded road base or subbase, crusher run (select material or fill), and other coarse and fine aggregates.

6/ Includes building products.

7/ Includes agricultural limestone and building products, poultry grit, and mineral food.

8/ Withheld to avoid disclosing company proprietary data; included in "Total."

9/ Includes cement and lime manufacture.

10/ Includes asphalt fillers or extenders and other fillers or extenders.

11/ Less than 1/2 unit.

12/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
MASSACHUSETTS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	2,540	$16,800	$6.61
Plaster and gunite sands	49	490	10.00
Concrete products (blocks, bricks, pipe, decorative, etc.)	51	530	10.39
Asphaltic concrete aggregates and other bituminous mixtures	215	1,930	8.97
Road base and coverings 2/	1,050	4,670	4.43
Fill	1,280	4,780	3.74
Snow and ice control	484	1,860	3.83
Railroad ballast	47	156	3.32
Other 3/	195	1,640	8.40
Unspecified: 4/			
Actual	801	3,800	4.75
Estimated	5,010	30,800	6.16
Total	11,700	67,500	5.76

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement and lime).

3/ Includes filtration and roofing granules.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
MASSACHUSETTS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	254	1,930	763	4,730	1,630	11,200
Asphaltic concrete aggregates and road base materials 3/	717	3,900	920	3,430	909	4,060
Snow and ice control	48	257	250	888	185	711
Railroad ballast	--	--	47	156	--	--
Other miscellaneous uses 4/	38	284	93	398	65	956
Unspecified: 5/						
Actual	109	491	423	1,900	269	1,410
Estimated	804	3,220	287	2,000	3,910	25,600
Total	1,970	10,100	2,780	13,500	6,970	43,900

1/ Data are rounded to three significant digits; may not add to totals shown.

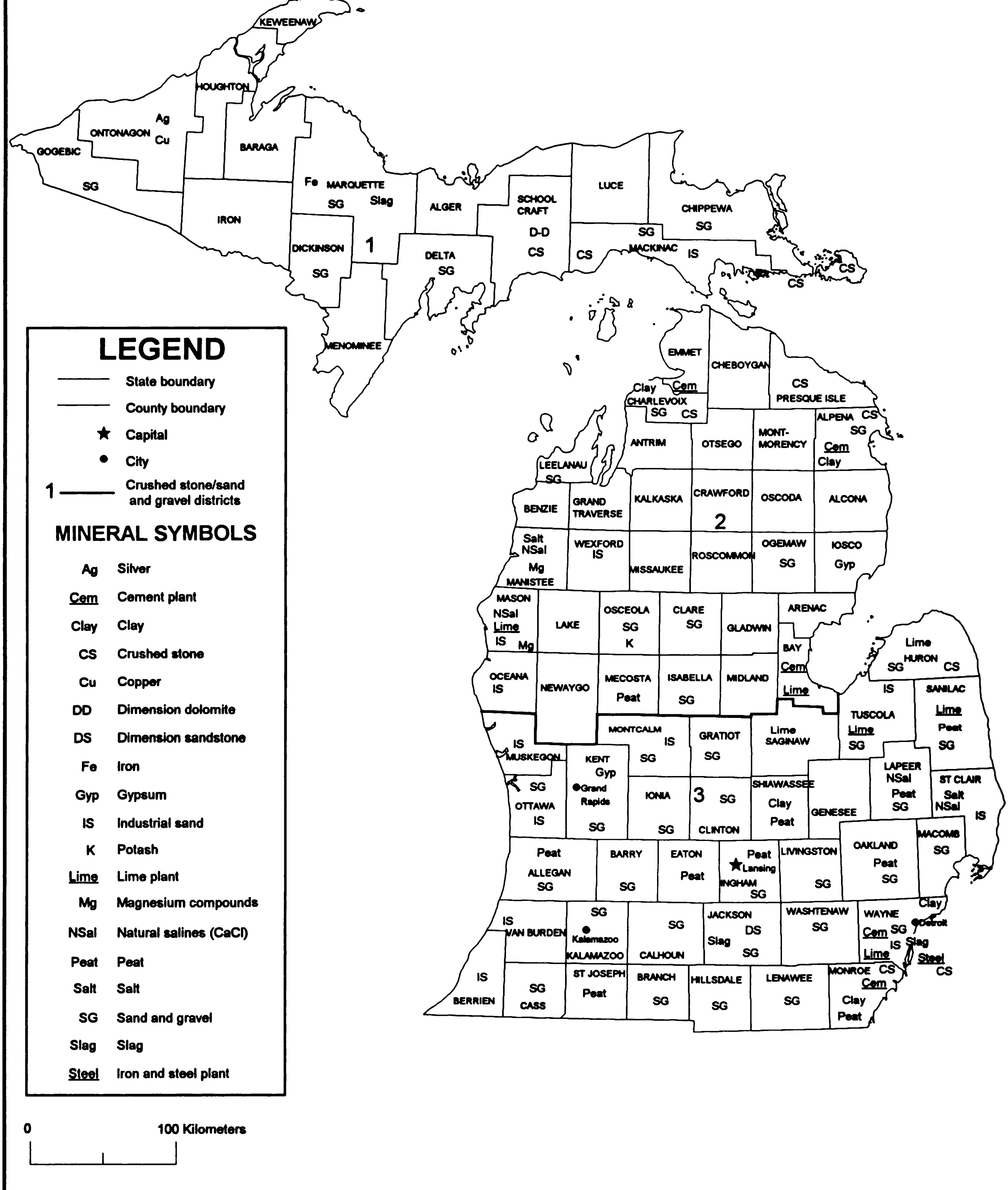
2/ Includes plaster and gunite sands.

3/ Includes fill and road and other stabilization (cement and lime).

4/ Includes filtration and roofing granules.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

MICHIGAN



Source: Geological Survey Division, Michigan Department of Natural Resources/U.S. Geological Survey

THE MINERAL INDUSTRY OF MICHIGAN

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Geological Survey Division, Michigan Department of Natural Resources, for collecting information on all nonfuel minerals.

In 1996, for the second consecutive year, Michigan ranked ninth in the Nation in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was more than $1.5 billion, virtually unchanged from that of 1995. This followed about a 2.7% increase from 1994 to 1995 (based on final 1995 data). The State accounted for nearly 4% of the U.S. total nonfuel mineral production value.

Michigan continued to be a major iron ore-producing State, second only to Minnesota. Iron ore was the State's leading commodity by value, followed by portland cement. The value of mine shipments of iron ore from the State's mines increased significantly. Large gains also occurred in the values of magnesium compounds and portland cement while there were smaller, yet significant, increases in those of construction sand and gravel and crushed stone. Other mineral commodities that increased in value included masonry cement, gypsum (crude), potash, iron oxide pigments, and dimension stone. Most of these gains were offset by decreases in other nonfuel mineral values, resulting in nearly the same total value for both 1995 and 1996. The most significant portion of the decreases resulted from the cessation of copper and silver mine production in the State and from the drop in the value of salt. In addition, the values of lime, bromine, and industrial sand and gravel moderately decreased; lesser decreases occurred for peat and common clays.

Compared with USGS estimates of the quantities produced in the other 49 States in 1996, Michigan remained first in magnesium compounds and iron oxide pigments; second in iron ore, industrial sand and gravel, bromine, and peat; third in construction sand and gravel; tied for fifth in gypsum; and seventh in masonry cement. The State rose from fourth to third in portland cement and potash and was a significant producer of crushed stone, lime, and common clays. Michigan dropped from fourth to fifth in the Nation in the manufacture of raw steel with an estimated output of more than 6.6 million metric tons[2] (7.3 million short tons), as reported by the American Iron and Steel Institute.

The following narrative information was provided by the Michigan Department of Natural Resources (MDNR), Real Estate Division (RED).[3] Late in 1996, the RED revised the metallic minerals leasing policy for State-owned mineral lands. The revised policy allows the State the option to direct lease metallic mineral rights when it is in the State's best interest to do so. This will allow quicker leasing, and applications may be submitted at any time. By yearend, several applications for direct leases had been received, and the review process had begun.

The MDNR reviewed the policy on sand and gravel extraction from State-owned lands. Specific nonmetallic mineral leases were proposed for some large, busy pits; while special use permits would continue to be used on the smaller ones. Fees were proposed to help cover costs associated with the process.

The Michigan Department of Environmental Quality (MDEQ), Geological Survey Division (GSD), proposed to abolish the Mine Reclamation Act at a public hearing in East Tawas. The act, which covers solid rock, open pit mines, and quarries, has no funding, weak rules, and seldomly has been enforced since the early 1980's. Environmental groups and mining companies requested that the State remain involved in mine reclamation so there would be consistency across the State, but the matter was left undecided.

Regarding mineral exploration in the State, two exploration plans were approved for existing State metallic mineral leases, while several older leases were surrendered by companies as they changed areas of interest. Metallic mineral exploration drilling was at a standstill. The GSD reported that no such holes were drilled during the year.

The GSD's statewide Geological Core and Sample Repository at Marquette again received materials from throughout the State in 1996. Two companies provided 170 boxes of materials from 15 mineral exploration drill holes. Oil and gas well samples were received from 14 companies for 103 wells. The GSD also has a large oil and gas sample collection in Lansing. A collection of selected Upper Peninsula water well samples were maintained by the MDNR RED geologist at Escanaba. These collections are open to the public by appointment.

Bitterroot Resources Ltd. of Canada announced an agreement with Copper Range Co. to acquire their mineral rights to about 26,000 hectares of Michigan's Upper Peninsula. At the same time that airborne and surface explorations were begun, Bitterroot also announced agreements to lease additional lands from other owners for mineral exploration. Crystal Exploration Inc., owned by Pathfinder Resources Ltd. of Canada, closed their diamond exploration project and Crystal Falls office this year. Previous to this, their last partner, Ashton Mining of Canada Inc., left the project.

Canada Inc., left the project.

As part of Kennecott Exploration Co.'s worldwide restructuring, the company closed its Crystal Falls office. Exploration will continue in Michigan by the Kennecott staff, which was relocated to North Carolina.

McKanna Mines & Minerals Co. of Hancock performed some initial exploration work on a known chalcocite vein in the upper level of the old Champion copper mine at Painsdale. Exploration efforts were expected to resume soon.

Minerals Processing Corp. of Champion was planning an exploration program for its land holdings in the State. The company also was custom-processing at its mill located at the old Humboldt iron mine.

A team of USGS geologists presented a paper at the fall 1996 Geological Society of America annual meeting entitled "Potential for Magmatic Ni-Cu Deposits in the Midcontinent Rift–A New Look Based on Voisey Bay and Noril'sk," in which they made reference to two areas in Michigan. In the abstract it was stated "We suggest that in the Lake Superior region good potential exists for magmatic Ni-Cu deposits in the ... Yellow Dog peridotite and Echo Lake gabbro in Michigan." State minerals officials anticipated that this may increase exploration efforts in the State.

Cleveland Cliffs Iron Co. (CCI), owned by Cleveland Cliffs Inc., operated Michigan's two iron mines, the Empire and the Tilden. These large open pit Marquette County mines were expected to produce 7.4 million and 5.8 million tons of ore and pellets, respectively, in 1996. The Empire produced magnetite ore and shipped both plain and fluxed pellets along with a small amount of siliceous iron ore. The Tilden mined both magnetite and hematite ores and shipped plain and fluxed pellets. Both mines shipped most of their product by rail to either Marquette or Escanaba for loading onto Great Lakes vessels for delivery to users, but a small portion of their production was sent to its final destination by rail.

In July, CCI applied to the MDEQ for approval to build another iron tailings basin for the Tilden Mine. The proposed 486-hectare impoundment would add 30 more years of tailings' capacity for the mine. The application was still under review at yearend. Tailings, the fine rock particles left after the iron minerals have been removed from the crushed ore, settle and accumulate in the basin; the process water is reused.

CCI announced the permanent closing of the Republic Mine, Republic, Marquette County. This open pit iron mine has been idle since 1981. Mining started in the Republic area in 1871. CCI operated the original mine from 1914 to 1937. In the 1950's, they reopened the mine and built a pellet plant in 1964. From 1956 to 1981, about 57 million tons of pellets were produced from Republic's ore. Reclamation of the mine area was in the planning stage and the plans have yet to be finalized.

Early in October, CCI announced the sale of their Ishpeming maintenance facility and some equipment to Malton Industrial Services Co. Malton will open a service center and supply some services to CCI's mines as well as other clients. Selected remaining operations were moved by CCI to the Empire and Tilden mine locations.

INMET Mining Corp.'s Copper Range Co. applied to the MDEQ for permits to convert parts of their idle White Pine underground copper mine to a solution mining operation. After 2.5 years of review, the MDEQ issued the required permits for full-scale solution mining in May 1996. In June, a Wisconsin Central Ltd. railroad shipment of acid for White Pine's mining project was delayed by residents near a train bridge in northern Wisconsin. The tracks were blocked again in July to prevent acid deliveries to White Pine, halting efforts to solution-mine the residual copper. Alternate shipping routes for the liquid were considered. Eventually, nonacid shipments resumed. In October, the United States Environmental Protection Agency (EPA) announced that they were starting a review of the solution-mining process. EPA had earlier declared it a State issue and had openly approved it. On October 14, 1996, Copper Range announced that it could not wait the anticipated 12 to 18 or more months for an EPA decision and were shutting down the pilot-scale solution-mining project. At yearend, EPA conducted a review. Copper Range continued to refine copper anode on a toll basis for a Canadian smelter at its White Pine refinery. Thus, a handful of jobs remained at White Pine where nearly 1,000 existed until September 1995. Full-scale solution mining could result in the creation of 200 to 300 jobs.

Red Metal Minerals Co., Hubbell, continued small scale-mining operations at the old Caledonia Mine near Mass in Ontonagon County. Native copper and related minerals were produced for sale to collectors and museums worldwide.

A number of limestone and dolomite quarries operated around the State. Aggregate, fluxstone, and raw material for cement manufacturing were several of the many products produced. Specialty Minerals at Port Inland, Michigan Limestone Operations at Calcite and Cedarville, Osborne Materials Co. at Drummond Island, and the Presque Isle Corp. at Stoneport supplied material for the fluxed iron ore pellets produced at the Empire and Tilden mines in 1996.

Cargill Inc. announced its purchase of the North American salt production, processing, and marketing operations of Akzo Nobel Salt Inc. The purchase included an evaporated salt operation at St. Clair.

Hart Packing Co. and Sargent Sand Co. both abandoned industrial sand production sites. Hart planned to reclaim a former sand dune mine site adjacent to Silver Lake State Park, Oceana County, and to expand the operation in Mackinac County, which was owned by their related company. Sargent Sand was expected to abandon property it owned within the Ludington State Park, Mason County.

There were several developments related to previously closed mines and mining areas. Michigan's Abandoned Underground Mine Inventory Project entered its second year. The project was financed by a 2-year, $200,000 State legislative appropriation. A professor at the Department of Mining Engineering of the Michigan Technological University, Houghton, was the contractor. Mine shafts and openings, surface subsidence, and near surface underground openings for more than 400 mines were to be indicated on maps compatible with the State geographical information system. Locations were to be ranked for safety needs, such as shaft capping and fencing of other openings. Public safety and local planning will benefit from this inventory. Stockpiles of usable byproducts, historical buildings, or potential uses for the sites were also to be noted. Cooperation of companies, county mine inspectors, local agencies, and all interested parties were requested to make the end product as useful and accurate as possible.

Surface subsidence, or caving, was a potentially dangerous feature around some of Michigan's abandoned underground mines. Caving at an abandoned mine was reported in the spring at Amasa, Iron County. An opening about 12 meters in diameter and about 27 meters deep to bedrock suddenly appeared a short distance from several homes. Safety fencing was installed by the county mine inspector.

The Quincy Mine Hoist Association, Hancock, started construction of a hillside tramway to take tourists from the hoist area down to the Quincy copper mine adit for mine tours. The tramway was being constructed where there was a tramway to haul copper and workers many years ago. Construction was to be completed in 1997.

The historic Cliffs Shaft Mine complex in Ishpeming was being considered for conversion to a tourist attraction by a nonprofit group. This iron mine was operated by Cleveland Cliffs Iron Co. from 1881 untilabout 30 years ago. Three distinctive shaft houses and other buildings were included in the proposed project, which will stress the importance of mining and its history to the area.

Wisconsin Central Transportation Corp. acquired the Escanaba ore dock and railroad lines in Michigan and Wisconsin from the Union Pacific Railroad Co. The purchase included the line from the Empire and Tilden iron ore mines to the Escanaba ore dock on Lake Michigan. They also were to continue to haul mine tailings from the closed Republic iron mine to the dock for shipment to the LaFarge Corp.'s cement plant at Alpena, MI. The Union Pacific bought the Chicago & Northwestern Railway (C&NW) properties in 1995. The C&NW had operated ore shipping facilities at Escanaba since 1864.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (e.g., construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] All tons are metric tons unless otherwise specified.

[3] Milton Gere, Geologist, authored the text of mineral industry information provided by the RED.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MICHIGAN 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	235	17,700	229	16,700	247	18,100
Portland	5,160	331,000	5,400	361,000	5,580	373,000
Clays	1,150	3,370	623	3,430	647	3,390
Gemstones	NA	2	NA	2	NA	W
Gypsum (crude)	1,790	15,300	1,510	14,900	1,360	15,300
Iron ore (usable)	13,800	W	13,500	W	W	W
Lime	637	33,000	653	34,600	484	25,300
Peat	156	5,090	173 3/	5,510 3/	168 3/	4,500 3/
Sand and gravel:						
Construction	48,800	160,000	53,500	178,000	54,400	185,000
Industrial	2,870	31,300	2,940	30,600	2,820	27,500
Stone:						
Crushed	35,000	113,000	37,500	127,000	38,000	131,000
Dimension metric tons	147 4/	35 4/	W	W	W	W
Combined values of bromine, copper (1994-95), iron oxide pigments (crude), magnesium compounds, potash, salt, silver (1994-95), stone [dimension dolomite and sandstone (1995-96), dimension sandstone (1994)], and values indicated by symbol W	XX	761,000	XX	736,000	XX	725,000
Total	XX	1,470,000	XX	1,510,000	XX	1,510,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Data series changed to production beginning in 1995; prior years shipment data may not be comparable.

4/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
MICHIGAN: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	18	$73	$4.06
Riprap and jetty stone	109	830	7.61
Filter stone	141	403	2.86
Other coarse aggregate	18	75	4.17
Coarse aggregate, graded:			
Concrete aggregate, coarse	4,130	10,200	2.48
Bituminous aggregate, coarse	803	3,010	3.75
Bituminous surface-treatment aggregate	156	883	5.66
Railroad ballast	48	252	5.25
Fine aggregate (-3/8 inch): Other fine aggregate			
Stone sand, concrete	8	114	14.25
Stone sand, bituminous mix or seal	566	1,560	2.75
Screening, undesignated	404	1,490	3.68
Other fine aggregate	W	W	3.51
Coarse and fine aggregate :			
Graded road base or subbase	1,870	7,720	4.14
Unpaved road surfacing	1,130	5,500	4.88
Crusher run or fill or waste	18	142	5.72
Other construction materials 3/	68	385	5.66
Agricultural: Agricultural limestone 4/	140	885	6.32
Chemical and metallurgical:			
Cement manufacture	6,040	12,000	1.98
Flux stone	3,340	12,400	3.73
Other miscellaneous uses 5/	3,280	10,700	3.26
Unspecified: 6/			
Actual	14,500	55,300	3.82
Estimated	766	2,830	3.69
Total	37,500	127,000	3.38

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Includes calcareous marl, dolomite, limestone, marble, miscellaneous stone, sandstone, shell, and traprock.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes drain fields.

4/ Includes other agricultural uses.

5/ Includes lime manufacture and sugar refining.

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
MICHIGAN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1995, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	24 2/	27,900 2/	$90,000 2/	$3.23 2/	21	29,200	$97,500	$3.35
Dolomite	6	6,810	22,200	3.25 r/	6	8,110	28,700	3.54
Traprock	1	19	43	2.26	1	13	26	2.00
Calcareous marl	2	W	W	3.58	2	W	W	4.08
Sandstone	3	W	W	2.91	2	W	W	13.20
Marble	--	--	--	--	1	W	W	3.00
Shell	--	--	--	--	1	W	W	6.68
Miscellaneous stone	1	W	W	1.40	1	W	W	1.40
Total	XX	35,000	113,000	3.23	XX	37,500	127,000	3.38

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes "limestone-dolomite," reported with no distinction between the two.

TABLE 4
MICHIGAN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 2/	W	W	166	716	W	W
Coarse aggregate, graded 3/	W	W	1,960	5,950	W	W
Fine aggregate (-3/8 inch) 4/	W	W	396	1,450	W	W
Coarse and fine aggregate 5/	W	W	633	2,530	W	W
Other construction materials 6/	3,370	6,660	22	128	2,940	5,230
Agricultural 7/	(8/)	(8/)	(8/)	(8/)	105	(8/)
Chemical and metallurgical 9/	(8/)	(8/)	(8/)	(8/)	1,190	(8/)
Unspecified: 10/						
Actual	3,680	13,200	7,130	26,300	3,660	15,700
Estimated	217	304	--	--	549	2,520
Total	10,000	26,400	19,100	62,100	8,430	38,300

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, and railroad ballast.

4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

5/ Includes graded road base or subbase, unpaved road surfacing, and crusher run (select material or fill).

6/ Includes drain fields.

7/ Includes agricultural limestone and other agricultural uses.

8/ Withheld to avoid disclosing company proprietary data; included in "Total."

9/ Includes cement manufacture, flux stone, lime manufacture, and sugar refining.

10/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
MICHIGAN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	6,410	$25,100	$3.91
Plaster and gunite sands	25	106	4.24
Concrete products (blocks, bricks, pipe, decorative, etc.)	301	1,070	3.54
Asphaltic concrete aggregates and other bituminous mixtures	4,600	18,000	3.91
Road base and coverings 2/	7,460	22,500	3.02
Fill	5,660	11,100	1.96
Snow and ice control	351	1,260	3.60
Railroad ballast	33	129	3.91
Filtration	69	488	7.07
Other	260	1,600	6.13
Unspecified: 3/			
Actual	16,600	56,500	3.41
Estimated	11,800	40,600	3.46
Total or average	53,500	178,000	3.34

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement and lime).

3/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
MICHIGAN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	346	1,620	955	3,360	5,440	21,300
Asphaltic concrete aggregates and road base materials 3/	1,510	3,830	1,760	4,810	8,790 4/	31,900 4/
Fill	433	773	282	640	4,940	9,680
Snow and ice control	28	51	W	W	W	W
Railroad ballast	31	111	W	W	W	W
Other miscellaneous uses 5/	--	--	311	1,310	343	2,000
Unspecified: 6/						
Actual	--	--	988	3,250	15,600	53,200
Estimated	1,680	5,410	1,700	4,840	8,370	30,400
Total	4,020	11,800	6,000	18,200	43,500 4/	148,000 4/

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

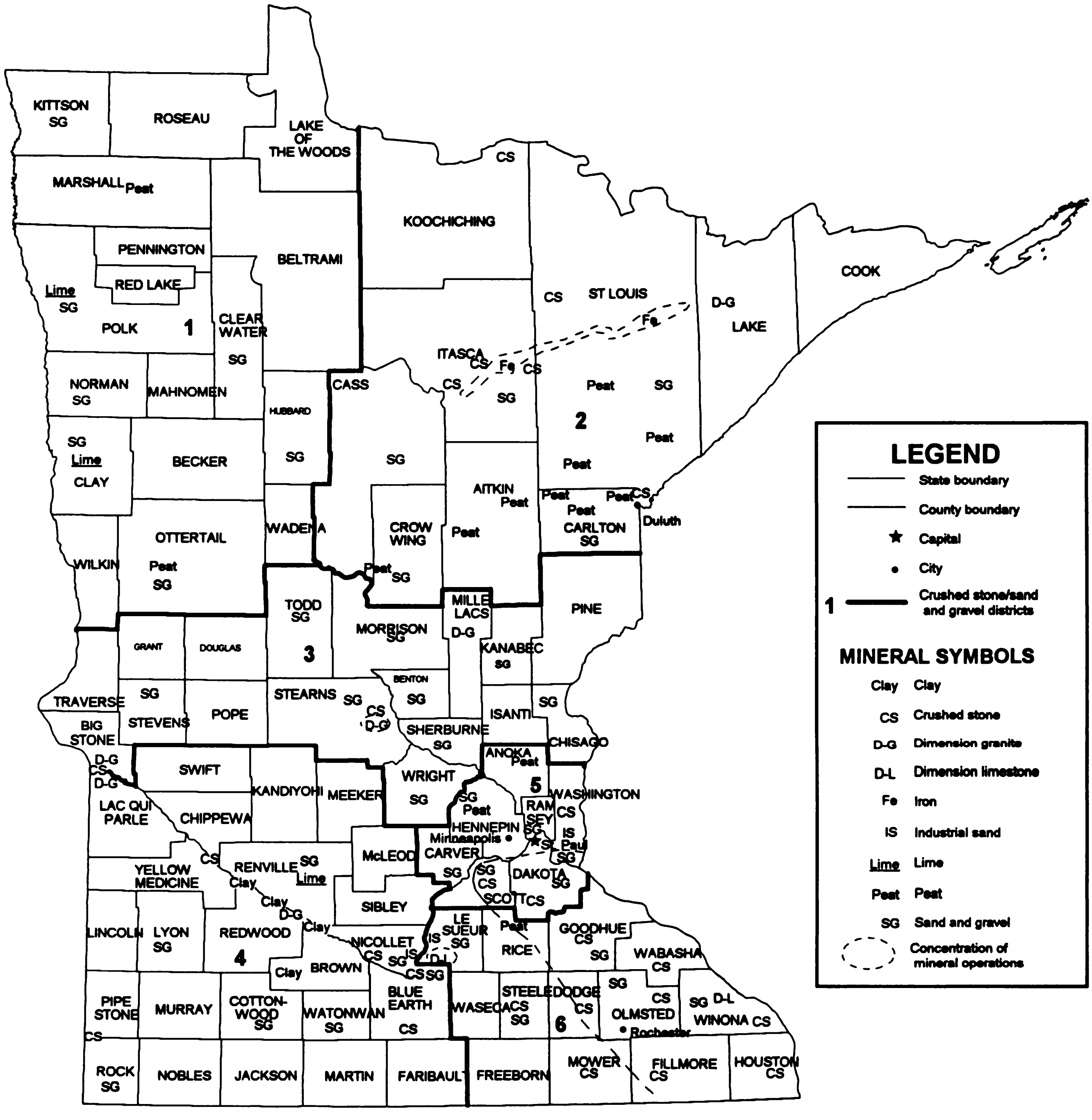
3/ Includes road and other stabilization (cement and lime).

4/ Includes unspecified within all districts.

5/ Includes filtration and roofing granules.

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

MINNESOTA



Source: Minnesota Department of Natural Resources, Minerals Division/U.S. Geological Survey

THE MINERAL INDUSTRY OF MINNESOTA

Minnesota climbed in rank from eighth to fourth among the 50 States in total nonfuel mineral production value[1] in 1996, according to the U.S. Geological Survey (USGS). The State's increase in rank was primarily the result of the increased production of iron ore. The estimated total nonfuel mineral value for the State in 1996 was almost $1.8 billion, a 19% increase from that of 1995. This followed about a 13% increase from 1994 to 1995 (based on final 1995 data). The State accounted for nearly 5% of the U.S. total nonfuel mineral production value.

Changes in Minnesota's total nonfuel mineral value, increases in 1992 and 1994-96 and a small drop in 1993, resulted mostly from the changes in iron ore shipments, although production of construction sand and gravel and crushed stone also contributed. In 1996, iron ore accounted for more than 88% of the State's nonfuel mineral value, while construction sand and gravel and crushed stone accounted for about 6% and 3%, respectively. In 1996, Minnesota returned to the level of ranking it held throughout most of the 1980-90 period when the State always ranked between second and sixth nationally in nonfuel mineral production value. During the early 1990's, iron ore prices and related production were lower. Compared with 1995, all other nonfuel mineral values *(See table 1)* increased in 1996 except for small decreases that occurred in industrial sand and gravel and both common and kaolin clays.

Compared to USGS estimates of quantities produced in the other 49 States in 1996, Minnesota remained first in the Nation in iron ore and fifth in the production of peat. Additionally, the State produced significant quantities of construction sand and gravel, crushed stone, industrial sand and gravel, and dimension stone.

The following narrative information was provided by the Minnesota Department of Natural Resources' Minerals Division (MDNRMD).[2] Minnesota continued to lead the nation in the production of taconite, a low-grade iron ore. The State's seven taconite plants produced pellets for steel mills as iron ore consumption remained strong. The ownership of Eveleth Mines was restructured. Oglebay Norton Co. will no longer be the managing agent as of 1997. A new company was formed, the Minnesota Iron and Steel Co., to pursue the development of direct reduced iron (DRI) on the Mesabi Range. The company studied the feasibility of building a pellet plant and DRI facility at the former site of Butler Taconite near Nashwauk. Minnesota Iron and Steel planned to sell taconite pellets to integrated steel producers and DRI to mini-mills that make steel from scrap.

Legislation passed in 1996 authorized the MinnesotaPollution Control Agency to issue permits for disposition of fine tailings from taconite processing facilities into taconite mine pits. Companies applying for a permit must demonstrate through an environmental impact statement (EIS) and risk assessment that deposition will not pose an unreasonable risk of pollution or degradation of groundwater.

About 800,000 hectares of State-owned mineral rights are available by application for metallic minerals leasing. Mineral rights were offered at public sale in 1995-96, but were not bid upon. At yearend there were 72 State metallic minerals leases in effect covering 12,300 hectares, with the leased lands located in Aitkin, Beltrami, Carlton, Crow Wing, Itasca, Koochiching, Lake of the Woods, Roseau, St. Louis, and Todd Counties. Cominco American Inc. held the largest number of State leases.

An EIS was completed for expanding the peat operations of the Hawkes Co. in Marshall County. MDNRMD believed it to be the first EIS in the nation completed for a peat operation. The operation was for the production of reed-sedge peat, and the property will be reclaimed as wetlands.

In cooperation with a number of mineral industry representatives, an ore deposit model for high-grade copper, gold, and platinum-group metals footwall mineralization was developed for the Duluth Complex. In central Minnesota, diamond drilling has revealed alteration of Proterozoic volcanic rocks of lode gold signature. Metallic minerals exploration data and maps for Carlton County have been compiled into a data format to make the information more accessible to exploration companies and amenable to new digital applications.

MDNRMD reported new aggregate resources needed to be identified in the State to address highway and development needs and for other land use planning. An aggregate potential map for eastern Clay County was completed in a digital format with an interactive digital database. New sites for testing have been identified in Cook County.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimated as of February 1997. Estimates for construction sand and gravel and crushed stone are periodically updated. To obtain the most recent information please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Kathy A. Lewis, Mineral Leasing Manager, authored the text of State mineral industry information provided by the MDNRMD.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MINNESOTA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

	1994		1995		1996 p/	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays	W	W	48	W	11 3/	W
Gemstones	NA	26	NA	26	NA	W
Iron ore (usable)	43,300	1,160,000	47,000	1,310,000	47,000	1,590,000
Peat	37	3,010	24 4/	2,070 4/	27 4/	2,240 4/
Sand and gravel (construction)	29,500	90,000	31,900	99,400	32,600	104,000
Stone:						
Crushed	10,900	47,100	11,300 5/	47,400 5/	12,000 5/	52,200 5/
Dimension metric tons	16,900 5/	W	26,900	11,100	29,600	11,100
Combined value of clays (common, kaolin), lime, sand and gravel (industrial), stone [crushed quartzite and traprock (1995-96), dimension dolomite and granite (1994)], and values indicated by symbol W	XX	44,900	XX	40,400	XX	39,500
Total	XX	1,340,000	XX	1,510,000	XX	1,800,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value" data.

4/ Data series changed to production beginning in 1995, prior years shipment data may not be comparable.

5/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
MINNESOTA: 1/ CRUSHED STONE 2/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 3/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	132	$716	$5.42
Filter stone	8	58	7.25
Coarse aggregate, graded:			
Concrete aggregate, coarse	355	1,500	4.23
Bituminous aggregate, coarse	160	737	4.61
Railroad ballast	690	4,210	6.10
Fine aggregate (-3/8 inch): Screening, undesignated 4/	159	776	4.88
Coarse and fine aggregates:			
Graded road base or subbase	1,370	4,300	3.13
Unpaved road surfacing	437	1,590	3.64
Terrazzo and exposed aggregate	(5/)	(5/)	2.97
Crusher run or fill or waste	365	430	1.18
Agricultural: Agricultural limestone 6/	179	778	4.35
Special: Asphalt fillers or extenders	(5/)	(5/)	2.76
Unspecified: 7/			
Actual	4,170	19,300	4.61
Estimated	2,870	11,900	4.14
Total	11,300	47,400	4.19

1/ To avoid disclosing company proprietary data; district tables were not produced for 1995.

2/ Includes dolomite, granite, and sandstone; excludes quartzite and traprock from State total to avoid disclosing company proprietary data.

3/ Data are rounded to three significant digits; may not add to totals shown.

4/ Includes stone sand (concrete) and stone sand (bituminous mix or seal).

5/ Withheld to avoid disclosing company proprietary data; included in "Total."

6/ Includes poultry grit and mineral food.

7/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
MINNESOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1995, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	49	7,670	$32,700	$4.26	30	7,500	$32,500	$4.33
Granite	4	W	W	4.64	5	W	W	4.63
Dolomite	4	W	W	3.02	5	W	2,420	W
Sandstone and quartzite	5	W	W	5.75	7 2/	W	W	4.27 2/
Traprock	6 r/	W	W	4.29	(3/)	(3/)	(3/)	(3/)
Total	XX	10,900	47,100	4.33 r/	XX	11,300	47,400	4.19

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Excludes quartzite from State total to avoid disclosing company proprietary data.

3/ Excludes traprock from State total to avoid disclosing company proprietary data.

TABLE 4
MINNESOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	6,690	$27,200	$4.07
Plaster and gunite sands	146	807	5.53
Concrete products (blocks, bricks, pipe, decorative, etc.)	625	2,300	3.68
Asphaltic concrete aggregates and other bituminous mixtures	3,020	14,100	4.68
Road base and coverings 2/	8,970	20,700	2.30
Fill	2,330	3,840	1.65
Snow and ice control	253	710	2.81
Filtration	26	202	7.77
Other 3/	245	800	3.27
Unspecified: 4/			
Actual	3,000	9,130	3.05
Estimated	6,610	19,600	2.97
Total or average	31,900	99,400	3.11

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement and lime).

3/ Includes railroad ballast and roofing granules.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
MINNESOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	2,280	11,000	506	2,320	1,030	4,300
Asphaltic-bituminous mixtures	815	2,080	119	425	893	4,570
Road base materials and fill 3/	1,560	3,160	1,230	2,700	3,630	7,180
Other miscellaneous uses 4/	11	101	197	377	20	150
Unspecified: 5/						
Actual	131	245	356	829	2	9
Estimated	1,580	4,610	272	955	1,930	6,210
Total	6,380	21,200	2,680	7,610	7,510	22,400

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	390	1,730	2,600	7,690	655	3,200
Asphaltic-bituminous mixtures	684	4,380	309	2,070	202	618
Road base materials and fill 3/	1,590	3,740	2,870	6,640	679	1,790
Other miscellaneous uses 4/	43	374	--	--	--	--
Unspecified: 5/						
Actual	309	968	1,950	6,370	244	703
Estimated	1,030	3,270	1,200	3,200	595	1,380
Total	4,040	14,500	8,930	26,000	2,370	7,690

1/ Data are rounded to three significant digits; may not add to totals shown.

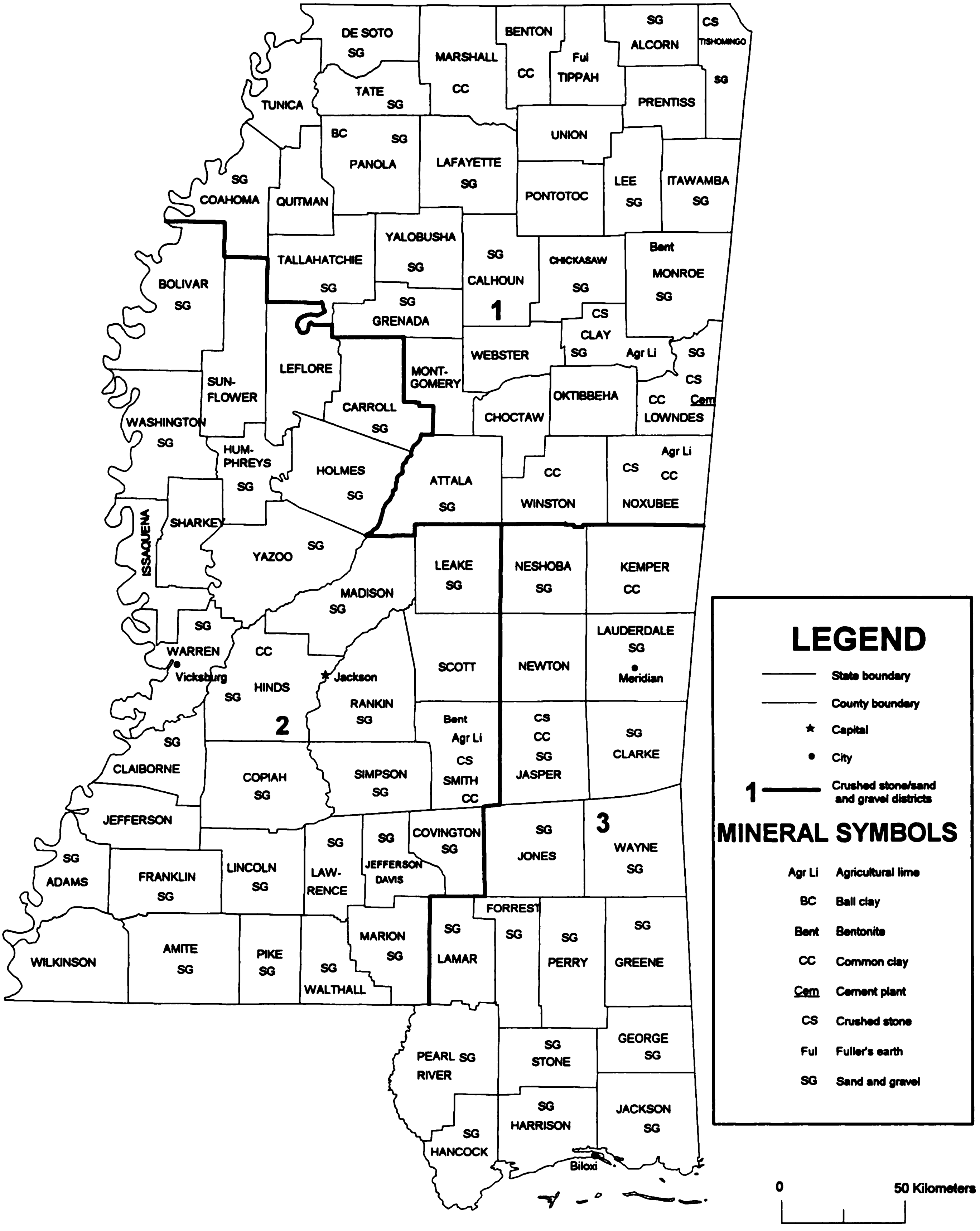
2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement and lime) and snow and ice control.

4/ Includes railroad ballast and roofing granules.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

MISSISSIPPI



Source: Mississippi Office of Geology, Department of Environmental Quality/U.S. Geological Survey

THE MINERAL INDUSTRY OF MISSISSIPPI

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Mississippi Office of Geology, Department of Environmental Quality, for collecting information on all nonfuel minerals.

In 1996, Mississippi remained 42d among the 50 States in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $140 million, nearly a 7% increase from that of 1995. This followed a 3.4% decrease from 1994 to 1995 (based on final 1995 data). The State accounted for a little less than 0.5% of the U.S. total nonfuel mineral production value in 1996.

Construction sand and gravel was the State's leading nonfuel mineral, accounting for 45% of the State's nonfuel mineral production value in 1996. The State's clays included ball clays, bentonite, common clays, and fuller's earth. Fuller's earth was the State's second leading mineral commodity with nearly 20% of the value, followed by portland cement. A 19% increase in the value of construction sand and gravel more than doubled the dollar decrease that occurred in common clays and accounted for most of the net increase for the State. Compared with 1995, other values that increased were those of crushed stone, portland cement, and fuller's earth, while no other mineral commodities decreased.

Based on USGS estimates of the quantities produced in the 50 States during 1996, Mississippi remained third in fuller's earth and bentonite and fourth in ball clay production. Additionally, significant quantities of construction sand and gravel and common clays were produced in the State. Metals produced in Mississippi, mostly that of raw steel, were processed from materials received from other domestic and foreign sources.

The Mississippi Department of Environmental Quality's (DEQ)[2] Office of Geology (OG) reported that several major road construction projects helped keep active permit numbers up in 1996. Casinos continued to play a big part in these permit numbers because of increased demand for construction and road-building material needed on the Gulf Coast and in certain counties along the Mississippi River where the casinos were located. Bond release applications and, thus, the amount of reclaimed land, were also on the increase.

Talks with Phillips Coal Co. continued in regard to its impending application for a lignite mine in Choctaw County. The proposed mine was planned to be similar to Phillips' other operations in Louisiana where lignite is strip mined and continuous reclamation is done. The company's plans include construction of a coal-fired, mine-mouth generating plant producing 400 megawatts of electricity. The permit application, which will probably be submitted in about mid-1997, will eventually apply to nearly 6,500 hectares. Baseline studies were started in 1996. The State of Mississippi continued working with DEQ's Office of Surface Mining on updating the Surface Coal Mining Rules and Regulations. The Surface Coal Mining Law also was undergoing updating by the legal division of the DEQ. This law revision should be ready to go before the State Legislature during its new term in 1997.

The OG is continuing the Mine Safety and Health Administration (MSHA) training for miners. This training is for operations that process mined material, such as rock crushing and gravel washing facilities, and is vitally important to the mining industry in Mississippi. The OG expects fatalities in the State to remain at low levels in large part because of this training. The OG began preparations for the Southeastern Regional Conference of MSHA Trainers that it was to host in March 1997 on the Gulf Coast in Biloxie.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. Construction sand and gravel and crushed stone estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Kenneth McCarley, Director, Division of Surface Mining and Reclamation, authored the text of minerals information provided by the Mississippi DEQ's Office of Geology.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MISSISSIPPI 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994 Quantity	1994 Value	1995 Quantity	1995 Value	1996 p/ Quantity	1996 p/ Value
Clays	1,190 3/	40,500 3/	1,230	44,000	1,140	40,300
Gemstones	NA	1	NA	1	NA	1
Sand and gravel (construction)	12,400	53,200	11,800	53,000	13,300	63,200
Stone (crushed)	1,900	7,500	1,990 4/	8,010 4/	2,200 4/	9,400 4/
Combined value of other industrial minerals	XX	33,900	XX	25,500	XX	26,600
Total	XX	135,000	XX	131,000	XX	140,000

p/ Preliminary. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value" data.

4/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
MISSISSIPPI: 1/ CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1995, BY KIND 2/

Kind	1994 Number of quarries	1994 Quantity (thousand metric tons)	1994 Value (thousands)	1994 Unit value	1995 Number of quarries	1995 Quantity (thousand metric tons)	1995 Value (thousands)	1995 Unit value
Limestone	4	1,870	$7,290	$3.90	4	1,990	$8,010	$4.03
Calcareous marl	3	26	203	7.81	(3/)	(3/)	(3/)	(3/)
Total	XX	1,900	7,500	3.95 r/	XX	1,990	8,010	4.03

r/ Revised. XX Not applicable.

1/ To avoid disclosing company proprietary data; district and use tables were not produced for 1995.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes calcareous marl from State total to avoid disclosing company proprietary data.

TABLE 3
MISSISSIPPI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	3,900	$18,600	$4.77
Plaster and gunite sands	80	364	4.55
Concrete products (blocks, bricks, pipe, decorative, etc.)	198	1,020	5.13
Asphaltic concrete aggregates and other bituminous mixtures	1,700	9,030	5.32
Road base and coverings 2/	937	4,090	4.37
Fill	384	1,000	2.60
Snow and ice control	1	4	4.00
Other	76	175	2.30
Unspecified: 3/			
Actual	2,400	10,100	4.22
Estimated	2,080	8,570	4.12
Total or average	11,800	53,000	4.51

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 4
MISSISSIPPI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	2,210	10,700	1,430	6,620	538 3/	2,670 3/
Asphaltic concrete aggregates and road base materials 4/	1,330	6,230	1,080	5,020	614 3/	2,870 3/
Snow and ice control	1	4	--	--	--	--
Other miscellaneous uses	72	152	--	--	4	23
Unspecified: 5/						
Actual	1,140	4,710	971	4,540	293	882
Estimated	155	777	1,390	6,090	534	1,710
Total	4,890	22,600	4,870	22,300	1,980 3/	8,150 3/

1/ Data are rounded to three significant digits; may not add to totals shown.

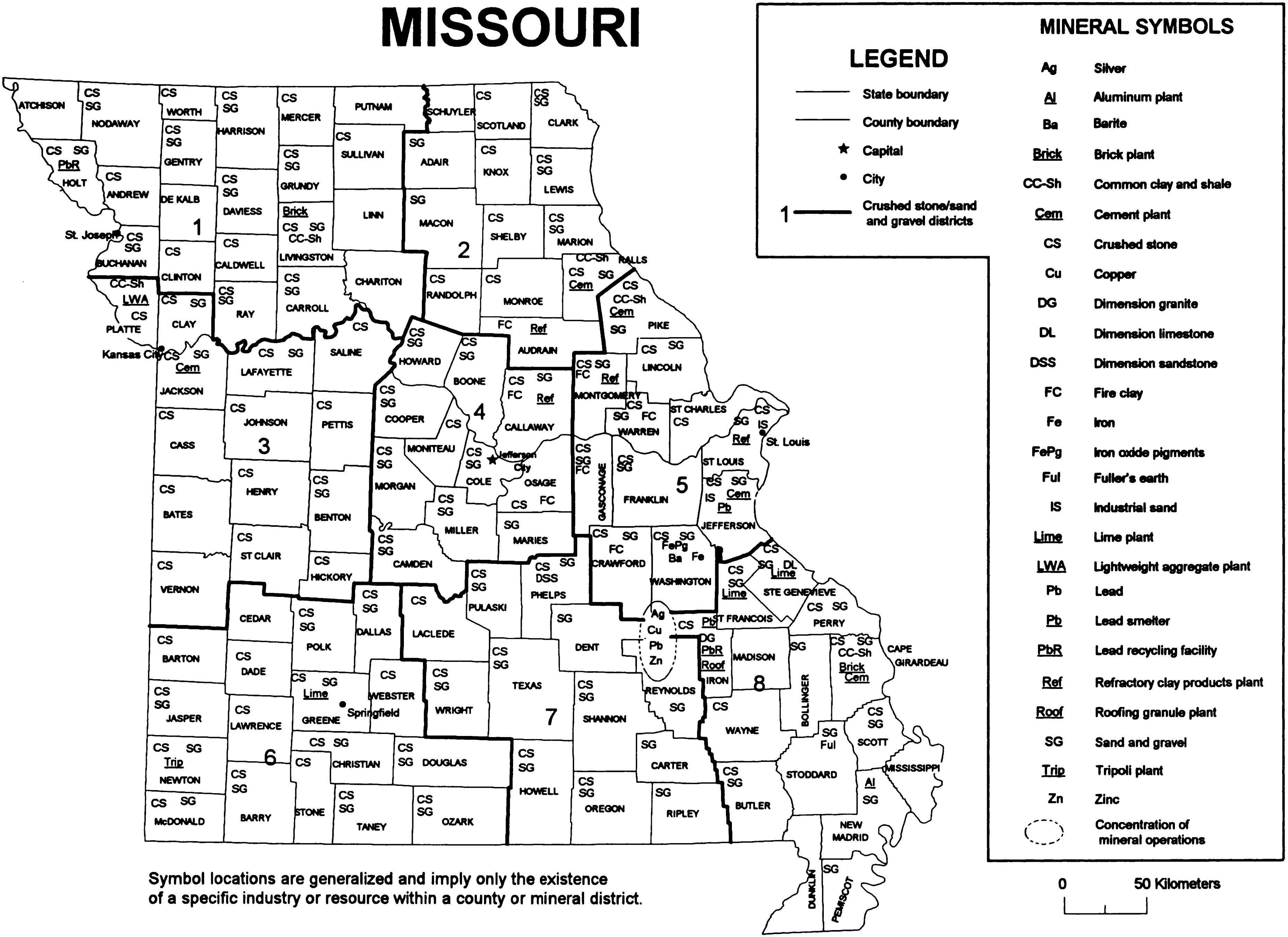
2/ Includes plaster and gunite sands.

3/ Includes unspecified within all districts.

4/ Includes fill, road, and other stabilization (cement).

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

MISSOURI



Symbol locations are generalized and imply only the existence of a specific industry or resource within a county or mineral district.

Source: Missouri Department of Natural Resources, Division of Geology and Land Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF MISSOURI

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey, and the Missouri Department of Natural Resources, Division of Geology and Land Survey, for collecting information on all nonfuel minerals.

In 1996, for the third consecutive year, Missouri ranked 10th among the 50 States in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $1.25 billion, about a 10% increase from that of 1995. This followed a 4.6% increase from 1994 to 1995 (based on final 1995 data). The State accounted for more than 3% of the U.S. total nonfuel mineral production value.

Missouri is, by a large measure, the top lead-producing State in the Nation. With a 24% increase in value, lead regained its standing in 1996 as Missouri's leading nonfuel mineral commodity. Except for several years in the mid-1980's and 1993-95, lead has been Missouri's leading nonfuel mineral since 1969. Crushed stone surpassed lead and portland cement in 1993 and ranked first through 1995. In 1996, crushed stone ranked second, portland cement, third, and lime, fourth. These four commodities accounted for 84% of the State's total nonfuel mineral value.

Significantly increased values for lead and lime, together with moderate increases for construction sand and gravel, portland cement, crushed stone, and silver accounted for most of the increase in 1996. Other values that increased were those of zinc, industrial sand and gravel, and iron oxide pigments. Mineral commodities that decreased in value in 1996 included copper, iron ore, masonry cement, common and fire clays, barite, and gemstones. In 1995, significant increases in lead, zinc, and fuller's earth clay values were about three times the decrease of crushed stone and construction sand and gravel combined.

Compared with USGS estimates of quantities produced in the other 49 States in 1995, Missouri remained first in fire clays and second in iron oxide pigments. The State also continued to rank third in iron ore and barite; third of four barite-producing States; fourth in crushed stone and zinc; fifth in portland cement and fuller's earth; and seventh in copper and silver. Missouri climbed from being one of the top six lime-producing States to first. Additionally, the State was a significant producer of industrial sand and gravel, masonry cement, and common clays.

The following narrative information was provided by the Missouri Department of Natural Resources, Division of Geology and Land Survey[2] (DGLS). Regulations for exploration drilling were revised and now include registration, casing, and plugging requirements. In general, all exploration drill holes are to be plugged with grout to within 61 centimeters of the surface and registered with the Missouri Department of Natural Resources, DGLS.

Several exploration companies were active during 1996, however, opposition to new and expanding quarry operations continued—especially in the West Plains and Kansas City areas.

Exploration for Olympic Dam-type iron-copper-gold deposits continued in Missouri. After originally granting permission to lease some of its land for mineral exploration, the Missouri Department of Conservation reversed its decision in response to complaints from environmental groups and some citizens. Doe Run Corp. had requested permission to explore on State forest lands in southeastern Missouri.

Lafarge Corp. continued design studies and exploration drilling at its Sugar Creek cement plant in Jackson County. Earlier, the company announced plans to build a new $135 million plant and underground mine at its existing site with start-up by the year 2000. The new plant will have the capacity to produce 800,000 metric tons of cement per year. Limestone for the cement making process will come from a 200-meter deep mine. The new plant will feature a single dry-process kiln with a five-stage preheater/precalciner tower to conserve energy. It will also employ sophisticated manufacturing control systems, including an on-line computerized analyzer that monitors product quality.

Mineral rights at the recently closed Magmont Mine were purchased by Doe Run Corp. from the previous operator, Cominco American Inc. Doe Run continued to mine on some parts of the property, using Doe Run facilities for crushing and hoisting. The head frame at the Magmont Mine site was taken down by a controlled blast on November 12.

Chemical Lime Co., headquartered in Fort Worth, TX, completed its first full year of operation at its new lime plant near Ste. Genevieve in Ste. Genevieve County.

Menefee Crushed Stone Co., with a quarry at Sedalia in Pettis County, was purchased by Lafarge Aggregates with regional headquarters in St. Louis, MO. Perry County Stone Co., with quarries in southeast Missouri and southwest Illinois, was purchased by Martin Marietta Aggregates.

G S Roofing Products Co. Inc., Irving, TX, purchased part of the Quality Aggregate Co. quarry and plant at Gads Hill, Wayne County from the Union Pacific Railroad. The operation will continue to produce railroad ballast and will add a new facility to produce roofing granules.

On June 20, Continental Cement Co. was purchased by a group of 10 investors, mostly from Missouri. The company is now known as Continental Cement LLC. Cement manufacturing and clay mining operations will continue with little change.

Sales of refractory clay products were at a relatively high rate for the second consecutive year in 1996. The demand for refractory clays for use in cement manufacturing continued to increase and exerted upward pressure on raw clay prices.

Coal production continued to decline in the State and at yearend only three small mines in Bates and Vernon Counties were active.

Three deaths occurred in Missouri's mineral industry in 1996. On May 10, two employees of Southwest Lime Co. were killed by a roof fall at the company's underground limestone mine near Neosho, Newton County. The State's third mineral industry fatality was a truck driver, who apparently fell from his truck while waiting to load cement at the River Cement Co. plant near Festus in Jefferson County.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (e.g., construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Ardel Rueff, Geologist, authored the text of State mineral industry information submitted by the Division of Geology and Land Survey.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MISSOURI 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1994		1995		1996 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
Cement (portland)		4,730	265,000	4,360	270,000	4,490	278,000
Clays		1,250 3/	7,910 3/	1,610	10,300 3/	1,530	3,760 3/
Copper 4/		8	18,900	7	22,800	9	22,000
Gemstones		NA	67	NA	58	NA	W
Lead 4/	metric tons	290,000	238,000	W	W	W	W
Sand and gravel:							
Construction		9,760	36,500	8,840	32,400	10,500	41,000
Industrial		559	9,970	W	W	W	W
Silver 4/	metric tons	40	6,860	W	W	W	W
Stone (crushed)		68,900	330,000	65,700 5/	305,000 5/	65,500 5/	311,000 5/
Zinc 4/	metric tons	42,000	45,600	W	W	W	W
Combined value of barite, cement (masonry), clays (fuller's earth), iron ore (usable), iron oxide pigments (crude), lime, stone [crushed granite (1995-96), dimension granite], and values indicated by symbol W		XX	128,000	XX	495,000	XX	596,000
Total		XX	1,090,000	XX	1,140,000	XX	1,250,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value" data.

4/ Recoverable content of ores, etc.

5/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
MISSOURI: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	241	$1,130	$4.69
Riprap and jetty stone	5,160	14,800	2.86
Filter stone	281	1,270	4.52
Other coarse aggregate	726	3,550	4.89
Coarse aggregate, graded:			
Concrete aggregate, coarse	2,860	15,100	5.30
Bituminous aggregate, coarse	2,080	10,800	5.22
Bituminous surface-treatment aggregate	1,070	4,980	4.67
Other graded coarse aggregate 3/	2,330	22,500	9.66
Fine aggregate (-3/8 inch):			
Stone sand, concrete	114	595	5.22
Stone sand, bituminous mix or seal	305	2,430	7.98
Screening, undesignated	1,380	4,660	3.37
Other fine aggregate	88	146	1.66
Coarse and fine aggregates:			
Graded road base or subbase	9,140	36,200	3.96
Unpaved road surfacing	2,350	10,700	4.54
Crusher run or fill or waste	785	3,180	4.05
Other coarse and fine aggregates 4/	1,990	10,500	5.30
Agricultural: Agricultural limestone 5/	1,090	4,170	3.82
Chemical and metallurgical:			
Cement manufacture	6,030	19,200	3.19
Lime manufacture	W	W	5.97
Dead-burned dolomite manufacture	W	W	7.21
Flux stone	W	W	7.25
Chemical stone	W	W	4.11
Special:			
Asphalt fillers or extenders	W	W	5.33
Whiting or whiting substitute	W	W	10.00
Other specified uses not listed	843	4,480	5.31
Unspecified: 7/			
Actual	11,900	64,600	5.41
Estimated	14,900	70,200	4.70
Total	65,700	305,000	4.64

W Withheld to avoid disclosing company proprietary data; included with "Other specified uses not listed."

1/ Includes dolomite, limestone, limestone-dolomite, and sandstone; excludes granite from total to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes railroad ballast.

4/ Includes roofing granules and terrazzo and exposed aggregate.

5/ Includes poultry grit and mineral food.

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
MISSOURI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1995, BY KIND 1/

Kind	1994				1995			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	195 r/	65,200 r/	$307,000 r/	$4.71	193	63,000	$292,000	$4.64
Dolomite	17 r/	2,020 r/	9,590 r/	4.76 r/	17	2,560	12,900	5.04
Granite	2	W	W	9.55	(3/)	(3/)	(3/)	(3/)
Sandstone	1	W	W	3.24	1	200	442	2.21
Total	XX	68,900	330,000	4.80 r/	XX	65,700	305,000	4.64

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes "limestone-dolomite," reported with no distinction between the two.

3/ Excludes granite from total to avoid disclosing company proprietary data.

TABLE 4
MISSOURI: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 3/	80	384	W	W	W	W	W	W
Coarse aggregate, graded 4/	W	W	W	W	1,710	1,960	1,110	6,320
Fine aggregate (-3/8 inch) 5/	W	W	W	W	W	W	W	W
Coarse and fine aggregate 6/	1,060	6,390	765	3,780	1,360	7,020	1,380	6,010
Agricultural 7/	47	191	62	154	197	479	66	238
Chemical and metallurgical 8/	--	--	(9/)	(9/)	(9/)	(9/)	--	--
Special 10/	--	--	--	--	--	--	--	--
Unspecified: 11/								
Actual	1,250	8,740	(9/)	(9/)	(9/)	(9/)	537	2,350
Estimated	1,470	7,450	1,910	9,780	1,870	8,930	1,450	6,160
Total	3,900	23,200	5,480	28,300	7,680	50,900	4,530	21,100

	District 5		District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 3/	654	2,940	W	W	W	W	W	W
Coarse aggregate, graded 4/	1,590	8,690	1,360	8,320	745	3,490	1,650	6,590
Fine aggregate (-3/8 inch) 5/	1,350	4,540	W	W	W	W	W	W
Coarse and fine aggregate 6/	4,830	20,500	1,600	8,130	256	1,120	9,400	29,200
Agricultural 7/	109	374	302	1,530	60	301	375	1,490
Chemical and metallurgical 8/	(9/)	(9/)	(9/)	(9/)	--	--	(9/)	(9/)
Special 10/	--	--	(9/)	(9/)	--	--	(9/)	(9/)
Unspecified: 11/								
Actual	(9/)	(9/)	3,280	16,800	63	307	465	1,950
Estimated	4,770	21,100	2,350	11,800	931	4,300	195	695
Total	18,900	77,900	9,290	48,500	2,060	9,530	13,900	46,000

W Withheld to avoid disclosing company proprietary data; included with "Coarse and fine aggregate."

1/ Excludes granite from total to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes crusher run (select material or fill), graded road base or subbase, other coarse and fine aggregates, roofing granules, terrazzo and exposed aggregate, and unpaved road surfacing.

7/ Includes agricultural limestone and poultry grit and mineral food.

8/ Includes cement manufacture, chemical stone for alkali works, dead-burned dolomite, flux stone, and lime manufacture.

9/ Withheld to avoid disclosing company proprietary data; included in "Total."

10/ Includes asphalt fillers or extenders, whiting or whiting substitute, and other specified uses not listed.

11/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
MISSOURI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	4,280	$14,400	$3.35
Plaster and gunite sands	4	35	8.75
Concrete products (blocks, bricks, pipe, decorative, etc.)	126	921	7.31
Asphaltic concrete aggregates and other bituminous mixtures	346	1,310	3.77
Road base and coverings 2/	252	985	3.91
Fill	88	316	3.59
Snow and ice control	53	252	4.75
Other 3/	48	417	8.69
Unspecified: 4/			
Actual	1,260	5,200	4.13
Estimated	2,390	8,610	3.61
Total or average	8,840	32,400	3.66

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Includes roofing granules.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
MISSOURI: C ONTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 4		District 5	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 3/	53	266	13	90	W	W	3,260	10,800
Asphaltic concrete aggregates and road base materials 4/	32	127	129	525	W	W	311	1,500
Unspecified: 5/								
Actual	--	--	28	119	1,090	4,200	--	--
Estimated	289	956	1,090	334	365	1,460	430	2,240
Total	374	1,350	1,270	4,080	1,610	6,210	4,000	14,600

Use	District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 3/	W	W	206	976	738	2,430
Asphaltic concrete aggregates and road base materials 4/	W	W	131	366	102	406
Unspecified: 5/						
Actual	31	238	15	101	100	548
Estimated	15	76	181	481	13	66
Total	107	845	532	1,930	953	3,450

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Production reported in District 3 was included with "District 2" to avoid disclosing company proprietary data.

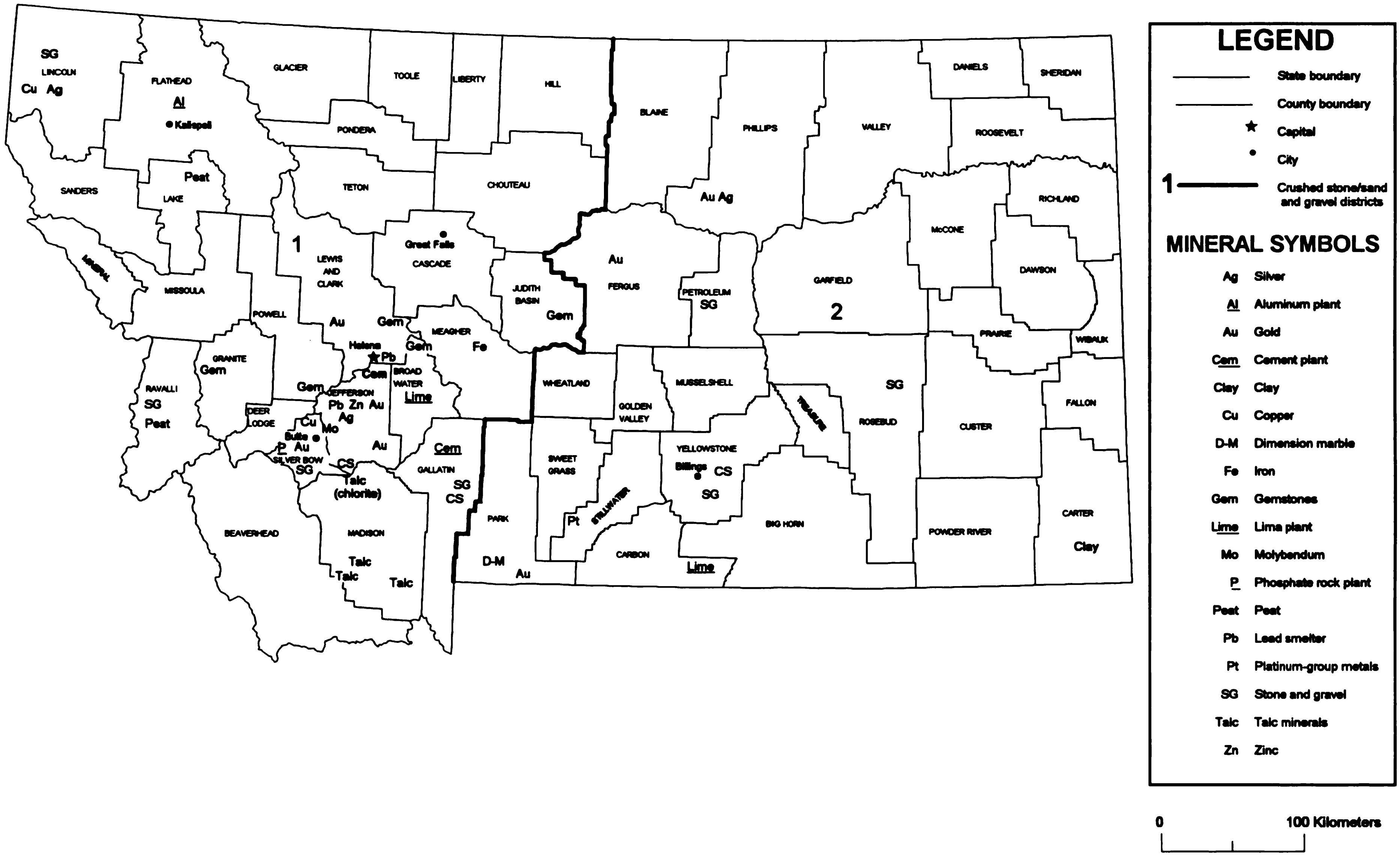
2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes plaster and gunite sands.

4/ Includes fill, road and other stabilization (cement), roofing granules, snow and ice control, and other miscellaneous uses.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

MONTANA



Source: Montana Bureau of Mines and Geology/U.S. Geological Survey

THE MINERAL INDUSTRY OF MONTANA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Montana Bureau of Mines and Geology for collecting information on all nonfuel minerals.

Montana was 26th in the Nation in nonfuel mineral production value[1] in 1996, according to the U.S. Geological Survey (USGS). The State was 22d in 1995. The estimated value for 1996 was $523 million, a 9% decrease from that of 1995. This followed a 5.9% increase from 1994 to 1995 (based on final 1995 data). The State accounted for about 1.5% of the U.S. total nonfuel mineral production value.

Overall, metallic minerals accounted for 76% of the State's total nonfuel mineral value. By value, gold was Montana's leading nonfuel mineral, followed closely by copper. Portland cement, the State's third-leading nonfuel mineral commodity accounted for approximately one-third of the State's total industrial mineral value.

In 1996, gold, silver, platinum, talc, lead, gemstones, iron ore, and dimension stone values increased. But relatively large decreases in the values for copper and molybdenum, together with lesser decreases for construction sand and gravel and lime accounted for the large majority of the year's overall decrease. Mineral commodities that also decreased in value, though in smaller amounts, were portland and masonry cement, zinc, palladium, bentonite clays, and crushed stone. No industrial sand and gravel production for 1996 was reported to the USGS. Conversely, increases in copper, molybdenum, construction sand and gravel, and zinc lead the way in the rise in value from 1994 to 1995.

Based on USGS estimates of the quantities produced in the 50 States in 1996, Montana continued as the only U.S. producer of primary platinum and palladium. The State remained first in the production of talc and pyrophyllite; second in bentonite; fourth in copper and lead; fifth in gold, zinc, and molybdenum; and sixth in silver. Because of the lack of a common physical unit to properly measure the quantity of gemstones produced, gem production is measured by value. Montana remained eighth in gemstone production.

The following narrative information was provided by the Montana Bureau of Mines and Geology[2] (MBMG). The State's mineral industry progressed into the first quarter of 1996 assuming that recent positive trends that the industry was then experiencing would continue. The industry had grown stronger during 1995 following difficult years in 1993-94. Prices in 1995 had been steady and the future seemed promising.

However, an initiative campaign, I-122, was successfully petitioned and directly brought before the citizens of the State for popular vote. I-122 addressed new water quality standards that MBMG and industry representatives reported would have a negative impact on the State's mineral industry if instituted. Whereas early polls indicated public opinion was supporting the new standards, the initiative was defeated. But the whole initiative process of the past months had a significantly negative effect on the State's mineral industry. Exploration budgets had been reduced, providing some of the funding needed to lobby against the initiative. Personnel were transferred to foreign projects, as the industry viewed the initiative as an 'indicator' of the ability to do business in Montana and the other States. Many capital investment projects were put on hold because of the perceived inability of corporations to potentially recapture their investments. In addition, mineral commodity prices were stagnant to depressed relative to those in 1995. All these factors contributed to a growing recession in mining exploration activities and investment. The following highlights of the industry include cautious development, permitting, and closure of some mines.

Pegasus Gold Inc.'s Beal Mountain Mine, a heap leach gold and silver project near Butte, scheduled completion of mining for October 1997. Pegasus completed its deep pumping program of the main pit, mined it, and began backfilling the pit with limestone-dolomite waste from its South Beal ore body during the winter. This will continue until the pit floor is above creek level.

Montana Resources Inc., at its Continental Pit, located adjacent to the Berkeley Pit in Butte, continued to encounter ore that was harder than that which it had mined in earlier years. Continental is an open pit copper, molybdenum, and silver operation. The mining of this harder ore continued to lower production rates as the mine's crushing and grinding circuits took more time with more equipment wear, resulting in higher costs to prepare the ore for the flotation circuits. The company researched more economical methods of size reduction in order to regain lost productivity.

Near Lincoln, the McDonald Gold project continued with unprecedented progress toward permitting. The joint venture between Phelps Dodge Corp. and Canyon Resources Corp. made it through the "completeness review" stage in less than a year. The draft Environmental Impact Statement was expected to be completed in 1998.

Placer Dome Inc.'s Golden Sunlight Mine (open pit gold and silver) near Whitehall experienced reorganization and layoffs as the company attempted to recapture some of the losses incurred by the surface sliding of the mill and dump areas during the past 2 years. Also in an attempt to improve the situation at Golden Sunlight, Placer Dome reduced its prestripping rate, increased mill throughput, and installed the Inco system for cyanide attenuation in its pond. This will eliminate the need for hazing programs for wildlife. Placer Dome continued with deep exploration as drill intercepts indicated a potential for underground reserves. The company granted a permit to construct an exploration decline (roadway) and hoped to start that portion of the project in the next few years.

Near Malta, Pegasus Gold's Zortman Mining Co. has been successful in achieving their permit for the Zortman Mine expansion. The Zortman Mine is an open pit, heap leach gold and silver mine. The company has voluntarily agreed to post a $32 million bond for the Zortman Mine expansion. Consequently, Zortman will build water treatment plants for impacted drainages, contract an evaluation of water quality on the Fort Belknap Indian Reservation, and build water systems for the towns of Hazen and Lodgepole. Construction for the mine expansion, however, has been temporarily stalled by the company until 1998.

TVX Gold, Inc. announced the closure of its Mineral Hill underground gold mine, suspension of development activities at the Crevice project, and progress on the construction of a decline at the 370-meter-level below the Mineral Hill Mill. All three are located near Gardiner and Yellowstone Park. The company cited high production costs and water control problems as reasons for its decisions to close the mine and cease activities at the Crevice project. Results of their drilling program on the Crevice project indicate high grade, narrow structures (0.6 to 1.8 meters wide) with visible gold. Some of the visible gold pieces were reported to exceed 1.9 centimeters in diameter. Earlier, TVX had placed the property on the market, but the MBMG reported the likelihood that TVX was reconsidering based on the results of this latest round of drilling.

The Stillwater Mining Co. continued development of levels and stopes off of the newly completed shaft at its Stillwater underground platinum and palladium mine, near Nye and Columbus. Stillwater has finished the mill expansion and construction of the base metal refinery, but development has not yet achieved the company's production goal of 1,800 metric tons per day. Early in the year, Stillwater ordered a tunnel boring machine (TBM) to develop its already permitted East Boulder project. However, because of depressed metal prices and insufficient development of the mine, the company postponed delivery of the TBM until financial conditions become more optimistic. Stillwater continued the permitting process for a new pond rock dump and slurry line on their property down river from the mine. Permits are expected in 1998.

Near Cooke City, the New World project (underground gold, silver, and copper) was on hold as Federal officials and environmental groups negotiated the exchange of private land holdings and unpatented mineral rights, currently controlled by Crown Butte Mines Inc., for surplus Federal property totaling $64 million. Much of the private land offered by Crown Butte was held by the company under leases with Montana citizens.

According to MBMG, exploration activity in Montana was severely affected by I-122. Newmont Exploration Ltd. transferred two geologists out of State early in the year and eventually closed their office in Helena, as did Santa Fe Pacific Gold Corp. Kennecott Corp. reorganized its operations, relocated to Reno and Anchorage, and terminated all but approximately 30 of the 90 member staff. ASARCO Incorporated made the decision to close its Spokane, WA, office, completely terminating its activities in the northwestern United States.

Significant exploration activity was limited to Orvana Resources Corp., Phelps Dodge Corp., and Cable Mountain Mining Co. South of Butte, Orvana Resources continued exploratory drilling for gold on and adjacent to the Highland Mine. The company completed 12,000 meters of drilling and discovered grades of up to 3.4 grams per metric ton in an intrusive formation. To date, drilling has outlined resources possibly containing 37,000 kilograms of gold, mainly in the Woolsey Shale. Orvana Resources believes the target it is pursuing has a potential for 93,000 to 160,000 kilograms of gold.

Phelps Dodge Corp. continued drilling on its Petty Ridge project, near Hot Springs. Although the company has explored the property for a number of years, MBMG reported hearing that the past field season included an extensive drilling program. The surrounding area has been drilled by Cominco American Inc. during past exploration programs. Both companies are evaluating the potential for economic reserves of lead and zinc in the Belt Supergroup rocks.

Cable Mountain Mines Co. continued exploration at its Basin Gulch property. Thus far, the company has drilled 270 holes, explored 30,000 meters of drilling, 5,200 meters of trenching, and has drill-indicated resources in excess of 31,000 kilograms of gold. While grades average 1.06 grams per metric ton, many multi ounce intercepts have been encountered. Kinross Gold, U.S.A. has taken an option on the property and is evaluating its potential for development.

Minor drilling was done by Kennecott Corp., Cominco

American Resources, Inc., Cameco Corp., Newmont Exploration Ltd., and some smaller companies in the Butte, Dillon, and Helena areas.

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All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (e.g., construction and and gravel, crushed stone, gold, and portland cement), stimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Robin B. McCulloch, Staff Mining Engineer, authored the text of mineral industry information submitted by the Montana Bureau of Mines and Geology.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MONTANA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1994 Quantity	1994 Value	1995 Quantity	1995 Value	1996 p/ Quantity	1996 p/ Value
Clays		28 3/	W	33 3/	90 3/	33 3/	90 3/
Gemstones		NA	3,400	NA	938	NA	1,030
Gold 4/	kilograms	12,600	156,000	12,400	155,000	12,500	157,000
Iron ore (usable)		--	--	5	60	W	W
Lead 4/	metric tons	9,940	8,140	W	W	W	W
Palladium	kilograms	6,440	29,400	5,260	22,000	5,000	21,700
Platinum	do.	1,960	25,300	1,590	20,800	1,600	21,100
Sand and gravel (construction)		7,360	28,800	8,870	34,900	7,680	26,900
Silver 4/	metric tons	71	12,000	76	12,600	94	16,000
Stone (crushed)		2,320	8,830	2,370 5/	9,920 5/	2,400 5/	10,200 5/
Zinc 4/	metric tons	21,000	22,800	22,700	27,900	W	W
Combined value of barite (1994), cement, clays [bentonite, common (1994), fire], copper, lime, molybdenum, peat, sand and gravel [industrial (1994-95), stone] [crushed quartzite (1995-96), dimension (1994), dimension miscellaneous (1995-96)], talc and pyrophyllite, and values indicated by symbol W		XX	249,000	XX	291,000	XX	269,000
Total		XX	543,000	XX	575,000	XX	523,000

NA Not available. p/ Preliminary. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value" data.

4/ Recoverable content of ores, etc.

5/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
MONTANA: 1/ CRUSHED STONE 2/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 3/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate, graded: Railroad ballast 4/	488	$2,590	$5.31
Coarse and fine aggregates: Graded road base or subbase 5/	387	1,780	4.59
Chemical and metallurgical: Cement manufacture	(6/)	(6/)	3.72
Special: Mine dusting or acid water treatment	(6/)	(6/)	3.31
Unspecified: 7/			
Actual	(6/)	(6/)	3.75
Estimated	444	1,670	3.77
Total	2,370	9,920	4.19

1/ To avoid disclosing company proprietary data; "District tables were not produced for 1995."

2/ Includes granite, limestone, sandstone, traprock and volcanic cinder and scoria; excludes quartzite from State total to avoid disclosing company proprietary data.

3/ Data are rounded to three significant digits; may not add to totals shown.

4/ Includes bituminous aggregate (coarse), bituminous surface treatment aggregate, and concrete aggregate (coarse).

5/ Includes crusher run or fill or waste, other construction materials, and riprap and jetty stone.

6/ Withheld to avoid disclosing company proprietary data; included in "Total."

7/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
MONTANA: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	11 r/	1,800 r/	$7,010 r/	$3.89 r/	11	1,960	$8,300	$4.23
Granite	1 r/	W	W	3.07 r/	--	--	--	--
Traprock	4 r/	326 r/	1,090 r/	3.34 r/	4	289	1,150	3.98
Sandstone and quartzite	3 r/	W	W	3.85 r/	3 2/	112 2/	457 2/	4.08 2/
Volcanic cinder and scoria	3	5	12	2.40	1	6	16	2.67
Total	XX	2,320	8,830	3.80	XX	2,370	9,920	4.19

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Excludes quartzite from State total to avoid disclosing company propietary data.

TABLE 4
MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	1,100	$5,840	$5.31
Plaster and gunite sands	25	121	4.84
Concrete products (blocks, bricks, pipe, decorative, etc.)	8	19	
Asphaltic concrete aggregates and other bituminous mixtures	1,270	6,660	5.26
Road base and coverings	4,300	15,300	3.55
Fill	429	1,100	2.55
Snow and ice control	141	603	4.28
Roofing granules	4	22	5.50
Filtration	20	84	4.20
Other 2/	45	259	5.76
Unspecified: 3/			
Actual	246	771	3.13
Estimated	1,290	4,160	3.23
Total or average	8,870	34,900	3.93

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes railroad ballast.

3/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Concrete aggregates	669	3,550	430	2,290
Plaster and gunite sands	25	121	--	--
Concrete (blocks, bricks, etc.)	8	19	--	--
Asphaltic-bituminous mixtures 2/	2,960	11,100	2,600	10,800
Other miscellaneous uses 3/	495	1,680	144	385
Unspecified: 4/				
Actual	246	771	--	--
Estimated	862	2,630	425	1,530
Total	5,260	19,900	3,600	15,000

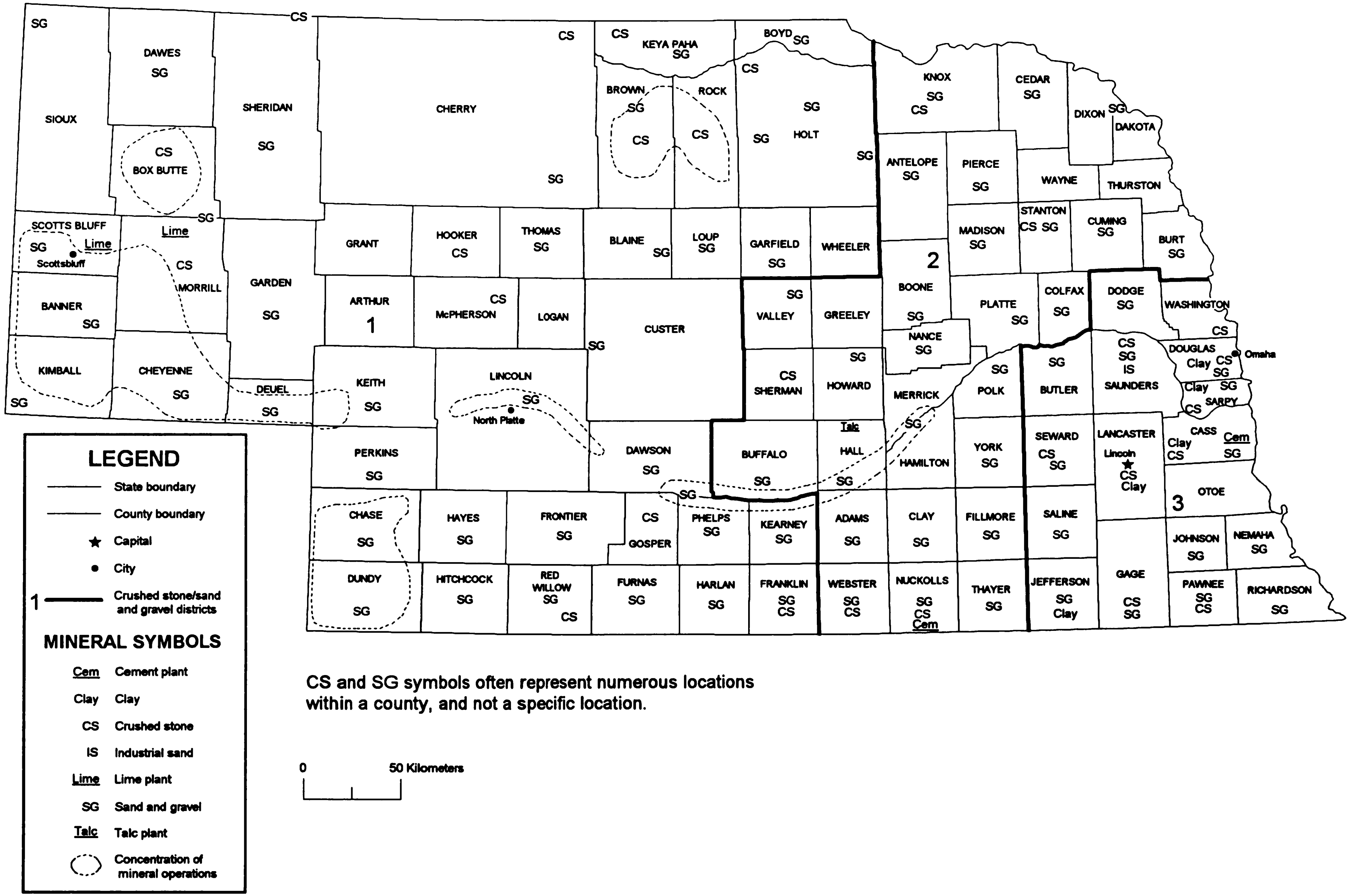
1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road base and coverings.

3/ Includes fill, filtration, railroad ballast, roofing granules, and snow and ice control.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

NEBRASKA



CS and SG symbols often represent numerous locations within a county, and not a specific location.

Source: University of Nebraska-Lincoln, Nebraska Geological Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF NEBRASKA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the University of Nebraska-Lincoln, Nebraska Geological Survey, for collecting information on all nonfuel minerals.

In 1996, for the 3d consecutive year, Nebraska ranked 41st among the 50 States in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $147 million, a less than 1% increase from that of 1995. The State accounted for a little less than 0.5% of the U.S. total nonfuel mineral production value. In 1996, all nonfuel mineral production values increased slightly except for crushed stone and lime, both of which experienced similarly small decreases. Metals produced in the State, mostly raw steel and lead, were processed from materials acquired from other domestic and foreign sources. Uranium was in situ leach mined at one location in northwestern Nebraska but is not included in USGS statistics because it is a fuel mineral.

The following narrative information was provided by the Nebraska Geological Survey[2] (NGS). For the past several years, the NGS has taken part in a joint exploration study of the Missouri River Basin. Together with geologists from nine other States and the USGS, the NGS continued to focus on three main areas of concern: the geology and mineral and water resources in the urban-rural corridor from Omaha to Kansas City, MO; related mining issues; and the effect of agriculture on the area. These studies were initiated because of increasing concerns about the interactions and potential effects of modern industry, mining, agriculture, and society on this busy urban-rural corridor. The joint effort will result in a large database, with maps and references, that will include a variety of information about the basin, including details about soil, rock formations, and water. The other participating State Geological Surveys include: Colorado, Iowa, Kansas, Minnesota, Missouri, Montana, North Dakota, South Dakota, and Wyoming.

ASARCO Incorporated's planned shutdown of its Omaha lead refinery was still in progress at yearend. The Omaha plant began operations in 1899, principally refining lead bullion produced by the company's facility in East Helena, MT.

Potash Corp. of Saskatchewan (PCS) acquired 100% of Texasgulf Inc. for a total of $810 million. Texasgulf has operated an underground limestone mine near Weeping Water since 1975. PCS also agreed to pay about $1.18 billion in cash and stock to acquire all outstanding common stock of Arcadian Corp., which was based in Memphis, TN, and has operations in Nebraska.

Interest was developing to reopen an old chalk mine in the central part of the State as a tourist attraction. Mining operations there dated from 1869 to the early 1950's. The mine was left open for picnickers and tourists until 1978 when the entrance collapsed.

Crow Butte Resources, Inc. proposed an expansion of its uranium mining facility near Crawford in northwestern Nebraska. Production from this in situ mining operation totaled approximately 373,000 kilograms (822,000 pounds) of yellow cake as of December 31, 1996.

Whereas little nonfuel mineral exploration was reported to occur during 1996, exploration for oil and gas continued in the western and southwestern parts of the State. In 1996, Nebraska's energy mineral production averaged 9,707 barrels of oil per day and 683 million cubic feet of casinghead gas and 1.3 billion cubic feet of dry gas per year. The State had 1,402 producing oil wells and 77 producing gas wells in 18 counties as of Dec 31, 1996.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (e.g., construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Raymond R. Burchett, Professor/Research Geologist, authored the text of mineral industry information submitted by the Nebraska Geological Survey.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEBRASKA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays	206	867	232	1,130	235	1,140
Lime	24	904	20	803	18	737
Sand and gravel (construction)	15,000	49,200	13,700	47,100	13,900	48,000
Stone (crushed)	6,890	41,600	6,590	41,800	6,400	40,900
Combined value of cement, gemstones, and sand and gravel (industrial)	XX	53,600	XX	55,500	XX	56,200
Total	XX	146,000	XX	146,000	XX	147,000

p/ Preliminary. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 2
NEBRASKA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	W	W	$7.63
Riprap and jetty stone	158	$1,460	9.25
Coarse aggregate, graded:			
Concrete aggregate, coarse	940	6,620	7.04
Bituminous aggregate, coarse	W	W	7.04
Coarse and fine aggregates:			
Graded road base or subbase	W	W	6.79
Unpaved road surfacing	330	2,650	8.02
Crusher run or fill or waste	513	3,550	6.92
Other construction materials 3/	827	4,700	5.68
Agricultural: Agricultural limestone 4/	295	2,620	8.87
Chemical and metallurgical:			
Cement manufacture	(5/)	(5/)	4.68
Flux stone	(5/)	(5/)	5.00
Special: Asphalt fillers or extenders	(5/)	(5/)	16.50
Unspecified: Actual 6/	2,120	13,500	6.39
Total	6,590	41,800	6.34

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Includes limestone.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Pipe bedding and screening (undesignated).

4/ Includes other agricultural uses.

5/ Withheld to avoid disclosing company proprietary data; included in "Total."

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
NEBRASKA: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	12	6,890	$41,600	$6.04	11	6,590	$41,800	$6.34

1/ Data are rounded to three significant digits.

TABLE 4
NEBRASKA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

	District 3	
Use	Quantity	Value
Construction aggregates:		
Coarse aggregate (+1 1/2 inch) 3/	W	W
Coarse aggregate, graded 4/	W	W
Coarse and fine aggregate 5/	843	6,170
Other construction materials 6/	1,930	12,800
Agricultural 7/	295	2,620
Chemical and metallurgical 8/	(9/)	(9/)
Special 10/	(9/)	(9/)
Unspecified: Actual 11/	2,120	13,500
Total	6,590	41,800

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ No crushed stone was produced in District 1 and 2.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes macadam and riprap and jetty stone.

4/ Includes concrete aggregate (coarse) and bituminous aggregate (coarse).

5/ Includes unpaved road surfacing and crusher run (select material or fill).

6/ Includes graded roadbase or subbase, pipe bedding, and screening undesignated.

7/ Includes agricultural limestone and other agricultural uses.

8/ Includes cement manufacture and flux stone.

9/ Withheld to avoid disclosing company proprietary data; included in "Total."

10/ Includes asphalt fillers or extenders.

11/ Includes production reported without a breakdown by end use.

TABLE 5
NEBRASKA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	2,970	$10,400	$3.51
Plaster and gunite sands	174	436	2.51
Concrete products (blocks, bricks, pipe, decorative, etc.)	127	356	2.80
Asphaltic concrete aggregates and other bituminous mixtures	828	3,080	3.72
Road base and coverings 2/	2,440	7,040	2.88
Fill	598	967	1.62
Snow and ice control	86	259	3.01
Other 3/	55	212	3.85
Unspecified: 4/			
Actual	1,490	6,690	4.49
Estimated	4,960	17,700	3.56
Total or average	13,700	47,100	3.43

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Includes railroad ballast and roofing granules.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
NEBRASKA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	439	1,500	675	1,950	2,150	7,740
Asphaltic-bituminous mixtures	294	876	319	1,080	215	1,120
Road base and coverings 3/	931	1,970	1,130	3,440	385	1,630
Other miscellaneous uses 4/	205	555	398	637	136	244
Unspecified: 5/						
Actual	72	273	304	1,020	1,120	5,400
Estimated	561	1,700	2,170	7,770	2,230 6/	8,190 6/
Total	2,500	6,880	4,990	15,900	6,230 6/	24,300 6/

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

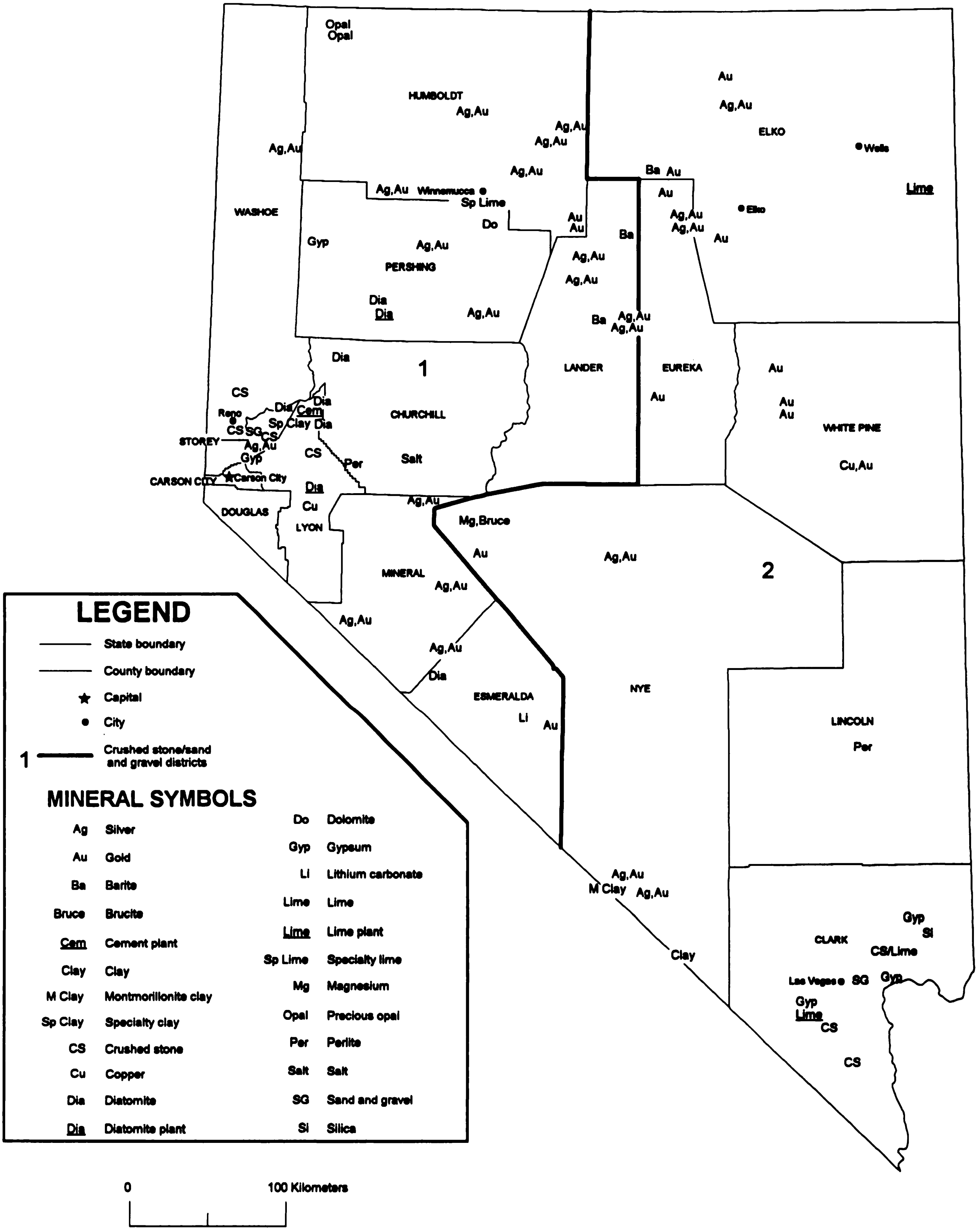
3/ Includes road and other stabilization (cement).

4/ Includes fill, railroad ballast, roofing granules, and snow and ice control.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

6/ Includes unspecified within all districts.

NEVADA



Source: Nevada Bureau of Mines and Geology/U.S. Geological Survey

THE MINERAL INDUSTRY OF NEVADA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Nevada Bureau of Mines and Geology for collecting information on all nonfuel minerals.

Nevada, the Nation's leading State in gold and silver production, ranked second in 1996 in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). This was the fourth year in the past 5 in which the State ranked second; in 1993, Nevada was first in the Nation. Nevada mines provided 66% and 44% of the Nation's gold and silver, respectively, and in so doing, the "Silver State" has been first in gold production since 1981 and in silver since 1987. The State's total estimated nonfuel mineral value for 1996 was about $3.2 billion, an increase of about 3% from that of 1995. The years 1994-95 were virtually identical, about $3.11 billion each (based on final 1995 data). The State accounted for more than 8% of the U.S. total nonfuel mineral production value.

Gold accounted for 84% of Nevada's nonfuel mineral value; industrial minerals, 9%; and copper, silver, and mercury the remaining 7%. In 1996, increases of about $71 million in the estimated value of copper and $37 million in gold accounted for the major portion of the increase in the State's nonfuel mineral value. Additionally, increases of approximately $10 million each in silver and portland cement values also supported Nevada's rise in value. Other nonfuel minerals that increased in value in 1996 included lime, diatomite, crushed stone, magnesite, crude gypsum, bentonite, gemstones, and brucite. Mineral commodities that showed a decrease in value in 1996 included construction sand and gravel, lithium minerals, industrial sand and gravel, barite, fuller's earth, perlite, and salt. Based on final 1995 data, a $44-million decrease in gold value from 1994 to 1995 was mitigated by increases in the values of most all other nonfuel minerals, especially those of silver, diatomite, portland cement, barite, and lime. Other nonfuel minerals that increased by at least $1 million in 1995 included construction sand and gravel, copper, magnesite, and lithium minerals.

Based on USGS estimates of quantities produced in the 50 States during 1996, Nevada remained first in gold, silver, barite, first of three mercury-producing States, and the only State to produce magnesite and brucite. The State also retained its 1995 ranking in a number of other mineral commodities—it was second in diatomite, second of two States that produced lithium minerals, fourth in crude gypsum, fourth of four crude perlite-producing States, and sixth in kaolin. Nevada moved up in rank from eighth to fifth in copper production. In 1995, the State was fourth in zeolites; data were not yet available for 1996. In addition, significant quantities of construction and industrial sand and gravel and lime were produced in the State.

The following narrative information was provided by the Nevada Bureau of Mines and Geology (NBMG) (Nevada Bureau of Mines and Geology, 1997). Mining in Nevada in 1996 grew during the prior year in terms of quantities produced and value. From the discovery of the Comstock silver deposits in 1859 until today, mining has had a major role in the State's economy and continues to be a major economic force in the State during 1996. NBMG has projected that this should continue for many years to come. The conditions that lead to this optimism are that most currently operating Nevada mines have significant discovered reserves with good potential to add to those reserves. Recent gold exploration efforts have been successful, and new large mining projects are being developed and will be on-line within the next several years.

According to NBMG's own survey canvass, Nevada had a record production year for several mineral commodities. The State reached a gold production milestone in 1996—exceeding 218,000 kilograms (7 million troy ounces). (All NBMG data used in this publication are nonproprietary data and may differ from some production figures reported to the USGS.) This was the first time any State has reached that mark in a single year. Silver production exceeded. 622,000 kilograms (20 million ounces) for the fourth year in a row. Also according to NBMG data, copper production increased more than tenfold with the startup of BHP Copper Co.'s Robinson Mine in the Ely area. Barite production was up by 28% as a result of aggressive marketing and slightly

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

improved demand.

Perhaps the most significant trend that has become increasingly evident during the past several years is the growing production of gold from underground operations. In 1997, nearly 20% of the State's gold production is expected to be produced using underground mining methods. Barrick Goldstrike Mines Inc.'s Meikle Mine in Elko County is the largest new contributor to this trend. Full production began in September 1996. Annual output in 1997 is expected to be about 13,500 kilograms. Employment in underground mines is growing as well, with nearly 1,400 direct mining jobs now assigned to underground operations.

More than 14,400 workers were employed by Nevada mining operations in 1996. The average annual pay for these workers, the highest of any sector in the State, is about $47,540, compared with the average salary in Nevada of about $26,630 per year. Nevada's annual payroll for the mining industry is now more than $680 million. In addition to the direct employment in mining, an estimated 48,000 additional jobs in the State are related to providing goods and services needed by the mining industry.

The taxes paid by the mining industry to State and local governments are derived from property taxes, sales and use tax, and, unique to the minerals industry, net proceeds of mines tax. These taxes paid by the mining industry totaled about $141 million in 1995. Total taxes paid for 1996 were not available for this report, but NBMG estimated that they would approximately equal those paid in 1995.

The economic impact of mining is important for the State as a whole, but the greatest impacts are felt by local communities near the mines. Towns like Elko, Lovelock, Battle Mountain, Winnemucca, Beatty, Eureka, and Ely enjoy healthy economies because of the high-paying employment and the taxes and contributions of the industry.

In addition to the positive economic impacts, growth related to mine development presents local governments and nearby communities with both challenges and difficulties. Strains on schools, police, and fire protection as well as other public services are felt when large mines open or undergo expansions. As a partial offset, many mining companies have provided donations of money, water systems, school buildings, buses, etc., to the communities where their mines are located. For example, Homestake Mining Co. built housing for more than 100 families in Eureka and has made donations for scholarships and civic events.

Before the onset of any mining project, plans, including those of proposed reclamation, must be submitted and permits obtained from Federal and State Agencies that have requirements to protect water, air, wildlife, land, and other resources. Nevada and Federal laws and regulations require that lands that are disturbed by mining be rehabilitated (reclaimed) for other purposes when mining is complete. The goal of mine reclamation is to return mined areas to a condition capable of supporting resources and activities such as wildlife habitat, livestock grazing, recreation, or new industrial uses. To ensure that reclamation of the mine is complete, bonds posted by operators and held by government regulators, are released only after the area is stabilized and reclamation criteria are met. Post-mine uses of the reclaimed land are targeted at having a beneficial economic impact on nearby communities and on the State.

In recent years, gold reserves, deemed minable at a profit under current economic forecasts, have been reported at or near currently operating Nevada mines. While production has been increasing, the quantities of reserves have also continued to grow. Current reserves reported at these operating mines was estimated at about 3.55 million kilograms (114 million ounces). While many Nevada mining operations have been able to add to reserves each year as a result of development drilling, it is also true that mining companies do not completely drill to the furthest extent of their ore deposits if currently discovered reserves are sufficient for their current planning horizon. There are likely extensive additional gold resources at properties that are currently in various stages of development and permitting. Major new gold mines were proposed for Eureka, Elko, Lander, Pershing, and Humboldt Counties. NBMG anticipated that these properties would likely continue contributing to Nevada production within the next 1 or 2 years.

As to future mining projects, the following was stated in the Nevada Bureau of Mines and Geology Special Publication MI-1995, The Nevada Mineral Industry 1995: "At the end of the year the published gold resources in Nevada, including minable reserves and perhaps some subeconomic resources, totaled 4,510 metric tons[2] (145 million ounces) of gold, enough to sustain gold production at substantial levels for 20 to 30 years, assuming stable prices."

Exploration for new deposits, particularly gold, continued to be an ongoing effort by all of the producing companies and many others not operating mines in the State. About 300 geologists in Nevada were employed primarily to explore for mineral properties which can be developed into new mines. These geologists with their support staff and expenditures on drilling, assaying, travel, and other related costs, represent a significant additional economic impact that is due to mining activity in Nevada.

Copper mining once again has become important to the economy of the State with the opening of BHP's Robinson

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[2] All tons are metric unless otherwise specified.

Mine in the Robinson district near Ely. Copper production began in February 1996 and 73,000 tons of copper in concentrate was shipped in 1996 to Arizona for smelting.

For more detailed information on mineral activity in Nevada, see the two annual NBMG reports that cover these topics. Major Mines of Nevada 1996, Mineral Industries in Nevada's Economy, NBMG Special Publication P-8 (released in May 1997), contains maps, mine-by-mine production statistics, addresses, and telephone numbers. The Nevada Mineral Industry—1996, NBMG Special Publication MI-1996, (scheduled for release in August 1997), contains a more complete directory and analysis of industry activities, including exploration and production in nonfuel mineral mining as well as for petroleum, natural gas, and geothermal energy. In addition, NBMG Special Publication 21, The U.S. Gold Industry 1996 analyzes useful production and operating information on the domestic gold industry. All three publications are available on the World Wide Web at <http://www.nbmg.unr.edu/>.

Reference Cited

Nevada Bureau of Mines and Geology, 1997, Major Mines of Nevada 1996— Mineral Industries in Nevada's Economy: Nevada Bureau of Mines and Geology Special Publication P-8, p. 22-27.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEVADA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Barite	284 3/	5,020 3/	W	W	W	W
Clays 4/	7	2,860	6	477	29	3,670
Copper 5/	6	15,800	6	19,800	W	W
Gemstones	NA	160	NA	306	NA	345
Gold 5/ kilograms	214,000	2,700,000	213,000	2,650,000	214,000	2,690,000
Sand and gravel:						
Construction	22,700	106,000	22,500	110,000	21,400	103,000
Industrial	572	W	W	W	W	W
Silver 5/ metric tons	673	115,000	766	127,000	791	135,000
Stone (crushed)	2,310	20,600	2,410	21,400	2,500	22,400
Combined value of barite, brucite, cement (portland), clays (fuller's earth, kaolin), diatomite, gypsum (crude), lime, lithium minerals, magnesite, mercury, perlite (crude), salt, and values indicated by symbol W	XX	149,000	XX	180,000	XX	282,000
Total	XX	3,110,000	XX	3,110,000	XX	3,230,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data.

XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain barites; value included with "Combined value" data.

4/ Excludes certain clays; kind and value included with "Combined value" data.

5/ Recoverable content from ores, etc.

TABLE 2
NEVADA: 1/ CRUSHED STONE 2/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 3/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Other construction materials 4/	624	$6,020	$9.65
Other miscellaneous uses 5/	1,020	11,900	11.65
Unspecified: 6/			
Actual	742	3,400	4.58
Estimated	19	89	4.68
Total	2,410	21,400	8.90

1/ To avoid disclosing company proprietary data; District tables were not produced for 1995.

2/ Includes dolomite, granite, limestone, miscellaneous stone, traprock, and volcanic cinder and scoria.

3/ Data are rounded to three significant digits; may not add to totals shown.

4/ Includes concrete aggregate (coarse), graded road base or subbase, and terrazzo and exposed aggregate.

5/ Includes agricultural limestone, flux stone, lime manufacture, mine dusting or acid water treatment, and other agricultural uses.

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
NEVADA: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	7	1,380	$13,000	$9.37	6	1,610	$13,300	$8.30
Dolomite	6	251	1,590	6.35	3	W	W	10.36
Granite	2	W	W	12.20	1	W	W	12.63
Traprock	2	W	W	4.87	1	W	W	4.26
Volcanic cinder and scoria	1	54	W	W	1	W	W	2.28
Miscellaneous stone	2	W	W	4.79	1	W	W	4.68
Total	XX	2,310	20,600	8.93	XX	2,410	21,400	8.90

W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 4
NEVADA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	7,270	$46,400	$6.38
Plaster and gunite sands	299	1,180	3.96
Concrete products (blocks, bricks, pipe, decorative, etc.)	206	1,280	6.20
Asphaltic concrete aggregates and other bituminous mixtures	2,460	12,300	5.02
Road base and coverings 2/	5,970	22,300	3.73
Fill	1,210	4,050	3.35
Snow and ice control	58	294	5.07
Railroad ballast	14	84	6.00
Other	567	3,310	5.84
Unspecified: 3/			
Actual	930	3,290	3.54
Estimated	3,550	15,300	4.32
Total or average	22,500	110,000	4.87

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
NEVADA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	1,270	6,750	6,500	42,100
Asphaltic-bituminous mixtures	1,000	6,050	1,460 3/	6,280 3/
Road base materials 4/	1,870	8,450	5,370 3/	18,200 3/
Other miscellaneous uses 5/	222	1,090	359	2,300
Unspecified: 6/				
Actual	114	189	816	3,110
Estimated	752	2,350	2,800	13,000
Total	5,230	24,900	17,300 3/	84,900 3/

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

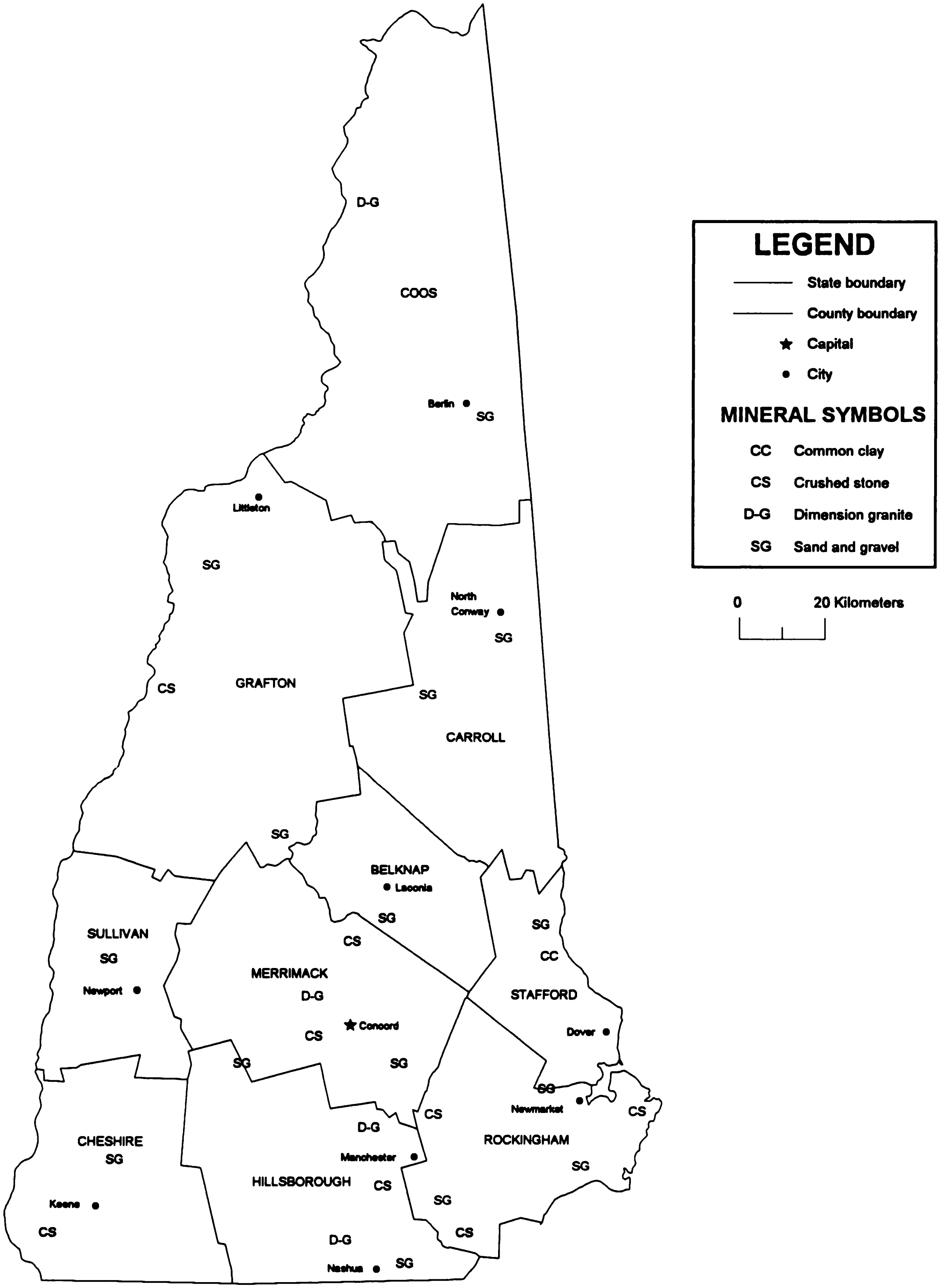
3/ Includes unspecified within all districts.

4/ Includes fill, road and other stabilization (cement), and snow and ice control.

5/ Includes railroad ballast.

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

NEW HAMPSHIRE



Source: New Hampshire Department of Environmental Services/U.S. Geological Survey

THE MINERAL INDUSTRY OF NEW HAMPSHIRE

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New Hampshire Department of Environmental Services for collecting information on all nonfuel minerals

In 1996, New Hampshire ranked 47th among the 50 States in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $44 million. The dollar value totals for 1994-96, as shown in table 1, are artificially low because data have been withheld to avoid disclosing company proprietary data. New Hampshire's ranking, however, was not affected by the withholding of data during this time period. Construction sand and gravel, a high-volume, low-value mineral commodity, was New Hampshire's leading nonfuel mineral commodity, accounting for about two-thirds of the State's nonfuel mineral production value. Crushed stone was the State's second leading nonfuel mineral. The major portion of the 1996 decrease in the State's nonfuel mineral value resulted from a 14% drop in construction and and gravel. Crushed stone and dimension stone values also decreased, though by smaller amounts.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. Construction sand and gravel and crushed stone estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEW HAMPSHIRE 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

	1994		1995		1996 p/	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays	3	16	3	16	3	16
Gemstones	NA	21	NA	9	NA	W
Sand and gravel (construction)	7,120	32,600	7,190	34,300	6,300	29,600
Stone:						
Crushed 3/	1,390	7,470	2,150	9,150	2,000	8,700
Dimension metric tons	35,300	6,300	23,000	6,290	30,000	5,530
Total 4/	XX	46,400	XX	49,800	XX	43,900

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; not included in "Total." XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain stones, values which must be concealed to avoid disclosing company proprietary data.

4/ Partial total, excludes values which must be concealed to avoid disclosing company proprietary data.

TABLE 2
NEW HAMPSHIRE: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregates: Other construction materials 3/	686	$5,320	$7.75
Unspecified: 4/			
Actual	537	1,450	2.69
Estimated	927	2,390	2.57
Total	2,150	9,150	4.25

1/ Includes granite and traprock; excludes limestone from State total to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes bituminous aggregate (coarse), graded road base or subbase, macadam, railroad ballast, riprap and jetty stone, stone sand (bituminous mix or seal), stone sand (concrete), and unpaved road surfacing.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
NEW HAMPSHIRE: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994 2/				1995 2/			
	Number of quarries	Quantity r/ (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Granite	7 r/	791	$3,010 r/	$3.81 r/	3	974	$3,510	$3.60
Traprock	4 r/	595	4,460 r/	7.50 r/	7	1,180	5,640	4.79
Total	XX	1,390	7,470	5.39	XX	2,150	9,150	4.25

r/ Revised. XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Excludes limestone from State total to avoid disclosing company proprietary data.

TABLE 4
NEW HAMPSHIRE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate and concrete products 2/	877	$7,860	$8.96
Asphaltic concrete aggregates and other bituminous mixtures	277	1,690	6.09
Road base and coverings	707	3,720	5.26
Fill	751	1,890	2.51
Snow and ice control	162	903	5.57
Railroad ballast	73	451	6.18
Other 3/	526	2,200	4.18
Unspecified: 4/			
Actual	1,470	4,510	3.08
Estimated	2,350	11,100	4.72
Total or average	7,190	34,300	4.77

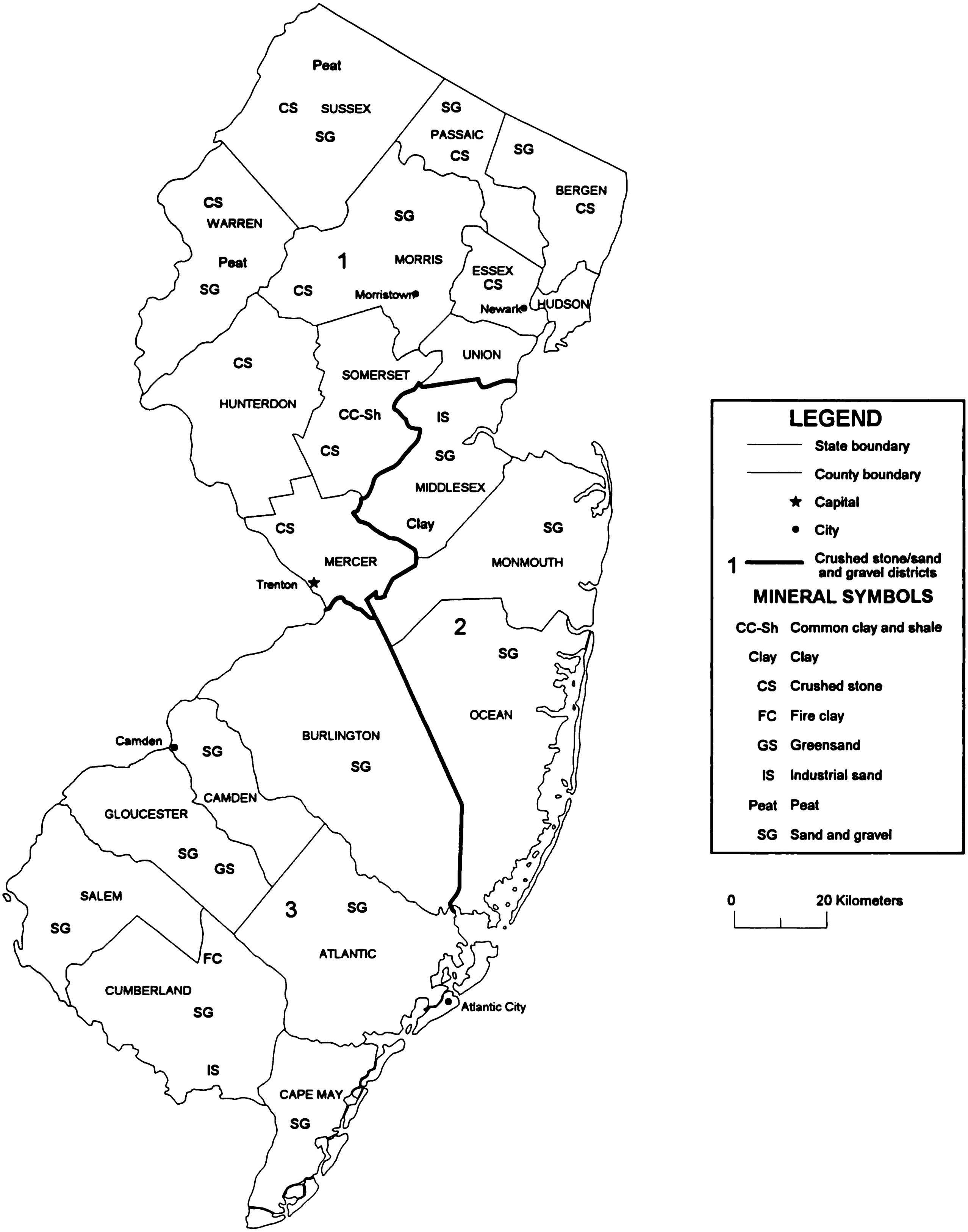
1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes filtration.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

NEW JERSEY



Source: New Jersey Geological Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF NEW JERSEY

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New Jersey Geological Survey for collecting information on all nonfuel minerals.

In 1996, New Jersey ranked 38th among the 50 States in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The State was 37th in 1995. The estimated value for 1996 was $222 million, an 8.7% decrease from that of 1995. This followed a nearly 16% decrease from 1994 to 1995 (based on final 1995 data). The State accounted for a little more than 0.5% of the U.S. total nonfuel mineral production value.

Crushed stone and construction sand and gravel, by value, were New Jersey's leading nonfuel mineral commodities. These two commodities accounted for all of the decrease in the State's nonfuel mineral value in 1996. Industrial sand and gravel, greensand marl, and peat all increased in value. The data for the latter two were withheld from table 1 to avoid disclosing company proprietary data. The changes in value from 1995 to 1996 were similar to those from 1994 to 1995 except that the decreases for crushed stone and construction sand and gravel were significantly higher (*see table 1*) and greensand marl and peat dropped some in value in 1995.

Based on USGS estimates of the quantities produced in the 50 States in 1996, New Jersey remained the only producer of greensand marl and third in the production of industrial sand. Greensand is used in the manufacture of some fertilizers as an organic conditioner for soils and less often as a water softening, filtration medium to remove soluble iron and manganese from well water. In addition, New Jersey's quarries and pits produced significant quantities of crushed stone and construction sand and gravel.

The following narrative information was provided by the New Jersey Geological Survey[2] (NJGS). New Jersey mining and exploration activities continued to be limited primarily to sand and gravel and crushed stone production, as has been the case for the last several years. Activities involving clay, greensand, and peat were stable, but were of relatively minor importance.

Exploration and development interest continued to be strong in the search for beach replenishment sand in Atlantic coastal waters. The U.S. Army Corps of Engineers and the New Jersey Department of Environmental Protection are involved in several long-term projects. The Monmouth County beaches, between Long Branch and Sandy Hook, so far have been replenished with 2.6 million cubic meters of sand, dredged from borrow sites 2 to 5 kilometers offshore. The beaches of Cape May City also have been replenished with about 230,000 cubic meters of dredged sand, from similar near shore borrow areas.

The NJGS extended a cooperative agreement it has with the U.S. Department of the Interior's Minerals Management Service (MMS) to locate and document offshore sand deposits suitable for beach replenishment. Sand resource identification was primarily focused on Federal waters beyond the 4.8-kilometer limit of State jurisdiction.

In May, the MMS released a Request for Information and Interest in the Federal Registry, concerning mining lease sales of federally controlled sand and gravel deposits off New Jersey. Public hearings and meetings were held on the commercial aspects of this type of mining.

The only significant offshore mining was done by Amboy Aggregates Joint Venture Co., of South Amboy, NJ. The company has been actively involved in commercial dredging of sand and gravel in New Jersey waters since 1985. Amboy is currently under contract with the U.S. Army Corps of Engineers to perform maintenance dredging in the Ambrose and Sandy Hook shipping channels in Raritan Bay. The dredging of this area, which began in December 1996 in the Sandy Hook Channel, will result in the removal of 1.1 million cubic meters of material over the next 10 years. Dredged sands and gravels are sized in their South Amboy plant and shipped by barge or truck to customers throughout the region.

Large-scale capital projects continue to be important contributors to the health of the New Jersey construction sector. Spending levels during the year in the public and commercial sector were approximately $6.3 billion, an increase of 17% over last year. Voter approval in November of a $350 million Dredging Bond Issue and a $600 million Transportation Trust Fund Renewal Bond Issue helps to insure continued strong growth in this sector.

Work continued in Atlantic City on major construction projects, including the new Convention Center and extensive casino construction and expansion projects. The design phase of the $300 million Mirage Casino Tunnel Project was completed, with construction slated to begin in 1997. Another major project undergoing work is the Hudson-Bergen Light Rail Project between Secaucus and North Bergen, NJ. This is a public-private partnership.

Merger activity in the mining sector during the year included Unimin Corp.'s take over of The Morie Company, Inc. A major transaction occurred between two British-owned industrial corporations. Tarmac PLC traded its private sector housing division, principally operating in the United Kingdom, with George Wimpey PLC for that company's minerals and construction businesses. In New Jersey, this affected a stone quarry in Lake Hopatcong, four asphalt plants in Lake Hopatcong, Kearny, Rockaway, and Roseland, and a contracting business and four aggregate depots in Upper Deerfield Township, Camden, Pleasantville, and Winslow.

Heavy mineral placer mining activity remained inactive during the year. No new land-based mining operations of any type started up during 1996.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. Construction sand and gravel and crushed stone estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Lloyd Mullikin, Supervising Geologist with the New Jersey Geological Survey, authored the text of mineral industry information used in the writing of this manuscript.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN NEW JERSEY 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994 Quantity	1994 Value	1995 Quantity	1995 Value	1996 p/ Quantity	1996 p/ Value
Clays	W	W	82	135	82	135
Gemstones	NA	1	NA	1	NA	1
Sand and gravel:						
Construction	16,100	100,000	14,000	80,300	12,000	67,200
Industrial	1,690	30,600	1,760	31,000	1,810	31,900
Stone (crushed)	19,800	154,000	21,000	132,000	19,300	123,000
Combined value of other industrial minerals	XX	4,460	XX	(3/)	XX	(3/)
Total	XX	289,000	XX	243,000 4/	XX	222,000

p/ Preliminary. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Value excluded to avoid disclosing company proprietary data.

4/ Partial total, excludes values which must be concealed to avoid disclosing company proprietary data.

TABLE 2
NEW JERSEY: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	191	$1,730	$9.06
Filter stone	149	1,230	8.23
Other coarse aggregate 3/	257	1,300	5.05
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,450	7,450	5.13
Bituminous aggregate, coarse	2,170	17,600	8.09
Bituminous surface-treatment aggregate	1,590	15,100	9.54
Railroad ballast	478	2,020	4.23
Other graded coarse aggregate	W	W	7.81
Fine aggregate (-3/8 inch):			
Stone sand, bituminous mix or seal	181	1,120	7.72
Screening, undesignated	983	6,640	6.75
Other fine aggregate 4/	913	8,660	9.49
Coarse and fine aggregates:			
Graded road base or subbase	1,320	10,500	7.96
Unpaved road surfacing	54	422	7.81
Terrazzo and exposed aggregate	W	W	12.10
Crusher run or fill or waste	132	485	3.67
Other coarse and fine aggregates 5/	3,760	26,400	7.02
Agricultural:			
Agricultural limestone	(6/)	(6/)	20.91
Poultry grit and mineral food	(6/)	(6/)	33.07
Chemical and metallurgical: Flux stone	(6/)	(6/)	18.00
Special:			
Asphalt fillers or extenders	(6/)	(6/)	13.90
Other fillers or extenders	(6/)	(6/)	19.28
Unspecified: 7/			
Actual	2,040	8,240	4.03
Estimated	5,240	21,000	4.01
Total	21,000	132,000	6.28

W Withheld to avoid disclosing company proprietary data; included with "Other coarse and fine aggregates."

1/ Includes granite, limestone, miscellaneous stone, sandstone, and traprock.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes macadam.

4/ Includes stone sand (concrete).

5/ Includes roofing granules.

6/ Withheld to avoid disclosing company proprietary data; included in "Total."

7/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
NEW JERSEY: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	1	W	W	$13.27	1	W	W	$12.02
Granite	9	7,460	$58,200	7.81	9	8,690	$67,800	7.80
Traprock	9	10,600	78,600	7.39	9	9,950	48,900	4.92
Sandstone	1	W	W	10.03	1	W	W	8.43
Miscellaneous stone	1	W	W	8.79	1	W	W	4.04
Total	XX	19,800	154,000	7.80	XX	21,000	132,000	6.28

W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 4
NEW JERSEY: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

Use	District 1	
	Quantity	Value
Construction aggregates:		
Coarse aggregate (+1 1/2 inch) 3/	597	4,260
Coarse aggregate, graded 4/	5,690	42,200
Fine aggregate (-3/8 inch) 5/	2,080	16,400
Coarse and fine aggregate 6/	5,260	37,700
Agricultural 7/	(8/)	(8/)
Chemical and metallurgical 9/	(8/)	(8/)
Special 10/	(8/)	(8/)
Unspecified 11/		
Actual	2,040	8,240
Estimated	5,240	21,000
Total	21,000	132,000

1/ No crushed stone was produced in District 2 and 3.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, and railroad ballast.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, crusher run (select material or fill), other coarse and fine aggregates, other graded coarse aggregate, and roofing granules.

7/ Includes agricultural limestone and poultry grit and mineral food.

8/ Withheld to avoid disclosing company proprietary data; included in "Total."

9/ Includes flux stone.

10/ Includes asphalt fillers or extenders and other fillers or extenders.

11/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
NEW JERSEY: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	4,740	$29,200	$6.16
Plaster and gunite sands	253	1,420	5.61
Concrete products (blocks, bricks, pipe, decorative, etc.)	443	2,010	4.53
Asphaltic concrete aggregates and other bituminous mixtures	1,680	9,670	5.77
Road base and coverings 2/	407	2,390	5.88
Fill	1,100	4,320	3.94
Snow and ice control	139	745	5.36
Other 3/	187	1,390	7.43
Unspecified: 4/			
Actual	3,050	16,600	5.44
Estimated	2,000	12,500	6.29
Total or average	14,000	80,300	5.74

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Includes filtration.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
NEW JERSEY: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	1,200	8,420	2,040	13,200	2,200	11,000
Asphaltic concrete aggregates and road base materials 3/	497	2,180	1,920	10,800	761	3,390
Snow and ice control	99	567	34	153	5	25
Other miscellaneous uses 4/	96	691	10	158	82	540
Unspecified: 5/						
Actual	--	--	1,360	7,730	1,700	8,880
Estimated	359	2,610	240	1,290	1,400	8,650
Total	2,250	14,500	5,600	33,300	6,140	32,500

1/ Data are rounded to three significant digits; may not add to totals shown.

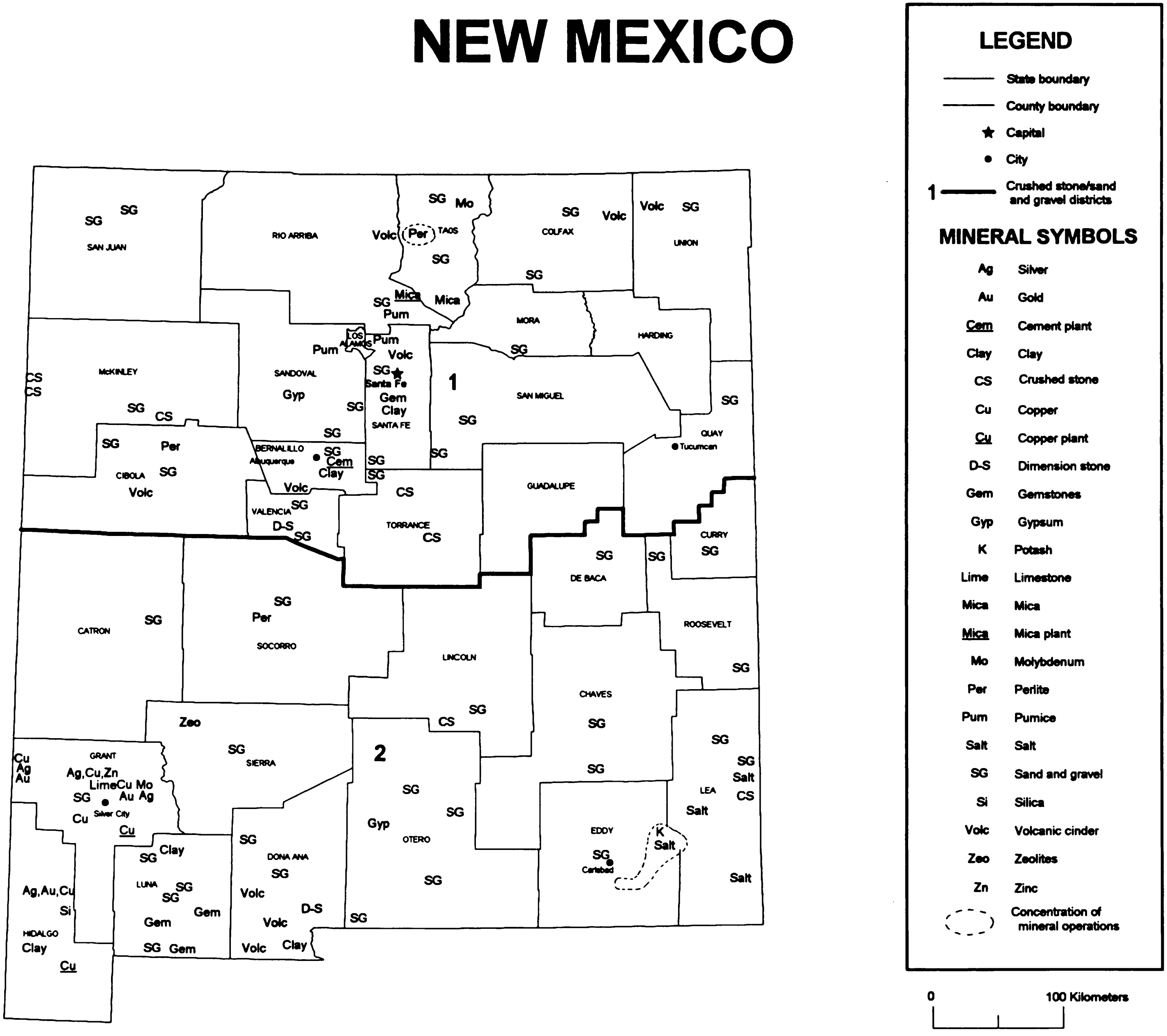
2/ Includes plaster and gunite sands.

3/ Includes fill and road and other stabilization (cement).

4/ Includes filtration.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

NEW MEXICO



Source: New Mexico Bureau of Mines and Mineral Resources/U.S. Geological Survey

THE MINERAL INDUSTRY OF NEW MEXICO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New Mexico Bureau of Mines and Mineral Resources for collecting information on all nonfuel minerals.

New Mexico ranked 12th among the 50 States in total nonfuel mineral production value[1] in 1996, according to the U.S. Geological Survey (USGS). The State was 11th in 1995. The estimated value for 1996 was $963 million, a 15% decrease from that of 1995. This followed a 21.5% increase from 1994 to 1995 (based on final 1995 data). The State accounted for about 2.5% of the U.S. total nonfuel mineral production value.

Copper and potash, by value, were the top nonfuel minerals mined in New Mexico. The two mineral commodities together accounted for 83% of the State's total nonfuel mineral production value and were about 15 times the value of New Mexico's next highest mineral commodity, construction sand and gravel. Most of the fluctuation in the value of New Mexico's mineral production was attributable to copper. In 1995, copper production rose about 7% at the same time that average annual copper prices rose by 25% to a record-high level. This resulted in a $190-million, or 33%, rise in the value of copper production in 1995. In 1996, despite a 2% rise in production, the value of copper declined by about 20%, or $150 million, owing to a fall in the average annual copper price. In 1996, potash also decreased in value *(see table 1)*, but the change was small relative to that of copper. Nonfuel minerals that increased in value in 1996 included those of construction sand and gravel, portland cement, gold, salt, silver, gypsum, iron ore, and gemstones. Other nonfuel minerals that decreased included crushed stone, perlite, and molybdenum. Pumice and mica also showed decreases for the year, but these were marginal. In 1995, in addition to the change in copper, a decrease in the value of potash was mostly offset by an increase in the value of portland cement.

Based on USGS estimates of the quantities produced in the 50 States during 1996, New Mexico continued to lead the Nation in potash, perlite, and zeolites. The State also remained second in pumice and crude mica production and third in copper. In addition, significant quantities of construction sand and gravel and gypsum were mined in the State.

The following narrative information was provided by the New Mexico Bureau of Mines and Mineral Resources[2] (BMMR). Production data in the following text are those reported by the BMMR, based on canvass survey data collected by New Mexico's Department of Energy, Minerals and Natural Resources (DEMNR) and related information collected by the BMMR. They may differ from some production figures reported to the USGS. The largest porphyry-copper deposit in New Mexico is Phelps Dodge Corp.'s Chino Mine at Santa Rita, where copper sulfides occur in the upper, fractured granodiorite and adjacent sedimentary rocks. According to the company's annual reports, Phelps Dodge produced a record 699,000 metric tons[3] of copper in 1996, including 3,400 tons of copper from precipitates at Tyrone, 69,000 tons of copper from electrowining at Tyrone, 90,000 tons of copper from concentrate at Santa Rita, and 63,000 tons of copper from electrowining at Santa Rita. The Tyrone porphyry-copper deposit in the Burro Mountains occurs within a quartz-monzonite laccolith and adjacent Proterozoic rocks. The concentrator processed approximately 270 million tons of ore grading 0.81% copper from 1969 to 1992. Before closing, approximately 386 million tons of ore grading 0.35% copper had been leached. Leachable reserves are estimated as 209 million tons of ore grading 0.35% copper. An Environmental Impact Statement (EIS) is being prepared for expansion at Santa Rita.

Mining continues at the Continental Mine in the Fierro-Hanover district, where Cobre Mining Co. Inc. reports reserves of more than 9 million tons of 0.92% copper. At the end of 1996, proven and probable reserves were estimated as 820,000 tons of copper. Expansion of the existing pit and new development of the porphyry-copper deposit at Hanover Mountain were delayed by a ruling from the U.S. Bureau of Land Management that Cobre must complete an EIS first. The EIS is scheduled for completion in September 1997, and the expansion and new development is anticipated for late 1997 or early 1998. Cobre Mining announced a merger with Aurex Resources Corp., a Canadian company, in March 1997.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs. gov/minerals/ contacts/comdir.html

[2] Virginia McLemore, Geologist, authored the information submitted by the New Mexico Bureau of Mines and Mineral Resources. She may be contacted at the same address and telephone and fax numbers as Dr. Chapin.

[3] All tons are metric tons unless otherwise specified.

The opening of Alta Gold Co.'s Copper Flat Mine at Hillsboro was delayed until preparation of an EIS (draft released February 1996). The New Mexico Mines and Minerals Department held public hearings in late 1996, and a mining permit may be issued before yearend 1997. No production is anticipated until 1999. The Copper Flat deposit, discovered in 1975, consists of copper, gold, molybdenum, and silver disseminated in a quartz-monzonite stock and in quartz veins. Unlike the Santa Rita and Tyrone deposits, there is no supergene enrichment zone at Copper Flat; Copper Flat is a high-grade hypogene deposit with low pyrite. Quintana Minerals Corp., prior to closure of the mine, produced approximately 3,000 tons of copper in March through June 1982. Minable reserves were estimated in 1984 as 54 million tons of 0.42% copper and 0.012% molybdenum (Dunn, 1982). Current reserves of the deposit are estimated as 221,000 tons copper, 7,120 tons molybdenum, 100 tons silver, and 7.6 tons gold (Dillard, 1995).

The Questa molybdenum mine, Questa, NM, was being prepared for operation. Molycorp. Inc., a subsidiary of Unocal Corp., operates Questa. A new section of the mine has been developed for use of load haul dump vehicles, and production is expected to be about 460 metric tons of contained molybdenum per month (Blossom, 1997).

San Pedro Mining Corp. applied for and received in November, a mining permit from the DEMNR's Mining and Minerals Division to reprocess the mine dumps at the San Pedro Mine in Santa Fe County for industrial grade garnet. The company still must obtain a mining permit from the Santa Fe County Mining Commission. The county claims that mining is not an appropriate use for the area.

An independent miner in a joint venture with Micrex Mineral Development Corp. (Canadian) continues to mine gold, silver, and silica flux at the Bank Mine in the Steeple Rock district in Grant County. Approximately 450 tons of ore is stockpiled grading 12 grams per ton gold and 274 grams per ton of silver (Rubin, 1997). The vein is approximately 1 to 4 meters wide. The Bank Mine is along the Summit vein along the northwest-trending East Camp-Summit fault where Biron Bay Resources Ltd. (Toronto, Canada) announced a discovery of 1.32 million tons of ore grading 6.2 grams per metric ton gold and 353 grams per ton of silver. Biron Bay plans to start mining in the next few years. R&B Mining Co.'s Center Mine in the same district closed in early 1995.

Summo Minerals Corp. of Vancouver is applying for mining permits to mine the Copper Hill deposit in the Picuris district in Taos County. The deposit is near Dixon and would be mined by open pit methods. Preliminary drilling indicates that the deposit could yield 9,000 to 14,000 tons of copper during a 10-year mine life. Exploration is still underway.

The New Mexico Environment Department requested that the U.S. Environmental Protection Agency assist in reclamation at the Stevenson-Bennett and Torpedo Mines in the Organ Mountains mining district.

In the beginning of 1996, the Carlsbad, NM, potash producers were Eddy Potash Inc. (EP), owned by Trans-Resources Inc.; IMC Global Operations Inc., owned by IMC Global Inc.; Mississippi Potash Inc. (MP), owned by Mississippi Chemical Corp.; New Mexico Potash, Inc. (NMP), owned by Trans-Resources; and Western Ag-Minerals Inc., owned by Rayrock Resources of Toronto, Canada. In the first quarter of 1996, IMC Global Inc. and The Vigoro Corp. merged into a single company. The potash portion of the company was named IMC Kalium and includes two domestic operations, one in Carlsbad and the other in Hersey, MI. The Carlsbad operation produces muriate of potash, sulfate of potash, and sulfate of potash-magnesia. In the third quarter of 1996, Mississippi Chemical completed negotiations with Trans-Resources to purchase EP and NMP. The purchase was valued at $45 million plus an adjustment for current working capital of about $11 million. EP became a wholly owned subsidiary of MP, and NMP was merged into MP. MP annual capacity was reported to be about 232,000 tons, and the combined annual capacity of EP and NMP was placed at 481,000 tons. These three operations produce only muriate of potash. Western Ag-Mineral reported that it had brought a continuous miner into its langbeinite mine and that the miner was working well. This mine has traditionally been an undercut-drill-blast-load operation because the ore was thought to be too hard for mechanical miners. At the end of the year, only three companies, IMC Kalium, MP, and Western Ag-Mineral, were operating in Carlsbad, NM. Potash Corporation of Saskatchewan Inc. of Canada continued to market potash exports for three New Mexico operations, now in a single company owned by Mississippi Chemical, as a cost-cutting effort for the producers (Searls, 1996).

The opening of Copar Pumice Co.'s El Cajete pumice mine in the Jemez Mountains was delayed until preparation of an EIS (draft scheduled for release in early 1997). The opening of the mine was anticipated for 1997 with a 10-year mine life.

Addwest Minerals, Inc.'s Wind Mountain nepheline syenite project in southern Otero County was on hold. The nepheline syenite was to be used as a constituent in amber-colored beverage containers, ceramics, and flat glass. The nepheline syenite contains high iron compared to other commercial sources of nepheline syenite, but, when the Wind Mountain nepheline syenite is crushed and passed through a specialized rare-earth magnet, the resulting nonmagnetic product is similar in composition to Grade B product specified by Unimin Canada Ltd. The magnetic fraction can be sold as millite, an iron-rich additive required for controlling the color of glass. Several other consumers have tested the nepheline syenite and found it suitable for use in ceramics, fiberglass, and flat glass. The lack of free silica as quartz also enables use of the Wind Mountain nepheline syenite as a silica-free abrasive. Interesting textural variations in the main mass of the syenite, wisps of finer grained material waving through the rock, also make it an attractive building stone. Mining will be underground by room-and-pillar methods. Construction of an adit, started in early 1995, continued. Processing will involve crushing, grinding, magnetic separation, and screening. At full production, Wind Mountain is expected to process 2,700 tons per day or 635,000 tons per year. Current proven, probable, and inferred reserves total 180 million tons for a mine life of more than 100 years.

Improvement in the price of uranium led to the continued operation by Quivira Mining Co. (successor to Kerr McGee Corp.) of mine water recovery of uranium from waters recovered from inactive underground operations at Ambrosia Lake, Grants, NM. Mine water recovery ceased in 1992 because of a decline in the price of uranium. Hydro Resources Inc, a subsidiary of Hydro Resources Inc., continues with plans to mine uranium by in situ leaching at Churchrock, and NZU Inc. plans to mine at Crownpoint, also by in situ leaching.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEW MEXICO 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

	1994		1995		1996 p/	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays 3/	127	269	127	274	127	274
Copper 4/	234	574,000	250	764,000	W	W
Gemstones	NA	14	NA	22	NA	W
Potash (K2O)	2,450	219,000	2,330	209,000	2,330	200,000
Pumice and pumicite metric tons	129,000	1,050	W	W	W	W
Sand and gravel (construction)	10,400	47,400	10,400	50,700	10,900	54,500
Silver 4/ metric tons	22	3,750	20	3,300	27	4,600
Stone (crushed)	3,550 5/	20,000 5/	3,660	18,800	3,600	18,700
Combined value of cement [masonry (1994), portland], gypsum, clays (fire), gold, gypsum (crude), iron ore (usable), mica (crude), molybdenum, perlite (crude), salt, stone [crushed quartzite and traprock (1994), dimension granite and marble (1995-96), dimension granite, marble, and miscellaneous (1994)], zeolites, and values indicated by symbol W	XX	65,100	XX	83,900	XX	685,000
Total	XX	930,000	XX	1,130,000	XX	963,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; value included with "Combined value" data.

4/ Recoverable content of ores, etc.

5/ Excludes certain stones; value included with "Combined value" data.

TABLE 2
NEW MEXICO: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch): Riprap and jetty stone 3/	24	$140	$5.83
Coarse aggregate, graded:			
Concrete aggregate, coarse	390	1,570	4.02
Bituminous aggregate, coarse	128	714	5.58
Bituminous surface-treatment aggregate	95	330	3.47
Other graded coarse aggregate 4/	655	5,320	8.12
Fine aggregate (-3/8 inch):			
Stone sand, concrete	W	W	1.09
Stone sand, bituminous mix or seal	6	8	1.33
Screening, undesignated	W	W	2.21
Coarse and fine aggregates:			
Graded road base or subbase	279	629	2.25
Unpaved road surfacing	34	195	5.74
Terrazzo and exposed aggregate	99	1,300	13.16
Crusher run or fill or waste	49	74	1.51
Other construction materials 5/	262	651	2.48
Chemical and metallurgical:			
Cement manufacture	(6/)	(6/)	4.65
Lime manufacture	(6/)	(6/)	9.96
Unspecified: 7/			
Actual	(6/)	(6/)	3.26
Estimated	693	3,160	4.56
Total	3,660	18,800	5.12

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Includes granite, limestone, miscellaneous stone, quartzite, traprock and volcanic cinder and scoria.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes other coarse aggregate.

4/ Includes railroad ballast.

5/ Includes roofing granules.

6/ Withheld to avoid disclosing company proprietary data; included in "Total."

7/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
NEW MEXICO: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	22 r/	1,890 r/	$8,700 r/	$4.60 r/	20	1,640	$6,180	$3.77
Granite	11	1,250	8,620	6.92 r/	4	1,470	9,110	6.21
Volcanic cinder and scoria	10	285	2,000	7.02	5	197	1,770	8.98
Traprock	(3/)	(3/)	(3/)	(3/)	1	W	213	W
Quartzite	(3/)	(3/)	(3/)	(3/)	1	W	W	10
Sandstone	4	1	5	5.00	--	--	--	--
Miscellaneous stone	3 r/	133 r/	642 r/	4.83 r/	2	W	W	4.53
Total	XX	3,550	20,000	5.62	XX	3,660	18,800	5.12

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes "limestone-dolomite" reported with no distinction between the two.

3/ Excludes quartzite and traprock from State total to avoid disclosing company proprietary data.

TABLE 4
NEW MEXICO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Construction aggregates:				
Coarse aggregate (+1 1/2 inch) 2/	W	W	W	W
Coarse aggregate, graded 3/	1,220	7,870	43	63
Fine aggregate (-3/8 inch) 4/	W	W	W	W
Coarse and fine aggregate 5/	302	1,950	163	300
Other construction materials 6/	W	W	--	--
Chemical and metallurgical 7/	(8/)	(8/)	(8/)	(8/)
Unspecified 9/				
Actual	(8/)	(8/)	(8/)	(8/)
Estimated	284	1,280	409	1,880
Total	2,950	15,800	708	2,910

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes riprap and jetty stone and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), and screening (undesignated).

5/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and crusher run (select material or fill).

6/ Includes roofing granules.

7/ Includes cement manufacture and flux stone.

8/ Withheld to avoid disclosing company proprietary data; included in "Total."

9/ Includes production reported without a breakdown by end use and estimates for nonrespondent.

TABLE 5
NEW MEXICO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate and concrete products 2/	1,860	$9,710	$5.23
Asphaltic concrete aggregates and other bituminous mixtures	880	4,510	5.12
Road base and coverings	1,560	6,710	4.30
Fill	243	567	2.33
Other 3/	156	809	5.19
Unspecified: 4/			
Actual	3,420	16,600	4.86
Estimated	2,280	11,800	5.18
Total or average	10,400	50,700	4.88

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes filtration, railroad ballast, and snow and ice control.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
NEW MEXICO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	931	5,220	926	4,490
Asphaltic-bituminous mixtures	668	3,200	212	1,310
Road base and coverings	866	3,990	693	2,720
Fill	134	257	110	311
Other miscellaneous uses 3/	70	542	86	267
Unspecified: 4/				
Actual	3,410	16,600	13	61
Estimated	1,950	10,800	326	995
Total	8,030	40,600	2,370	10,200

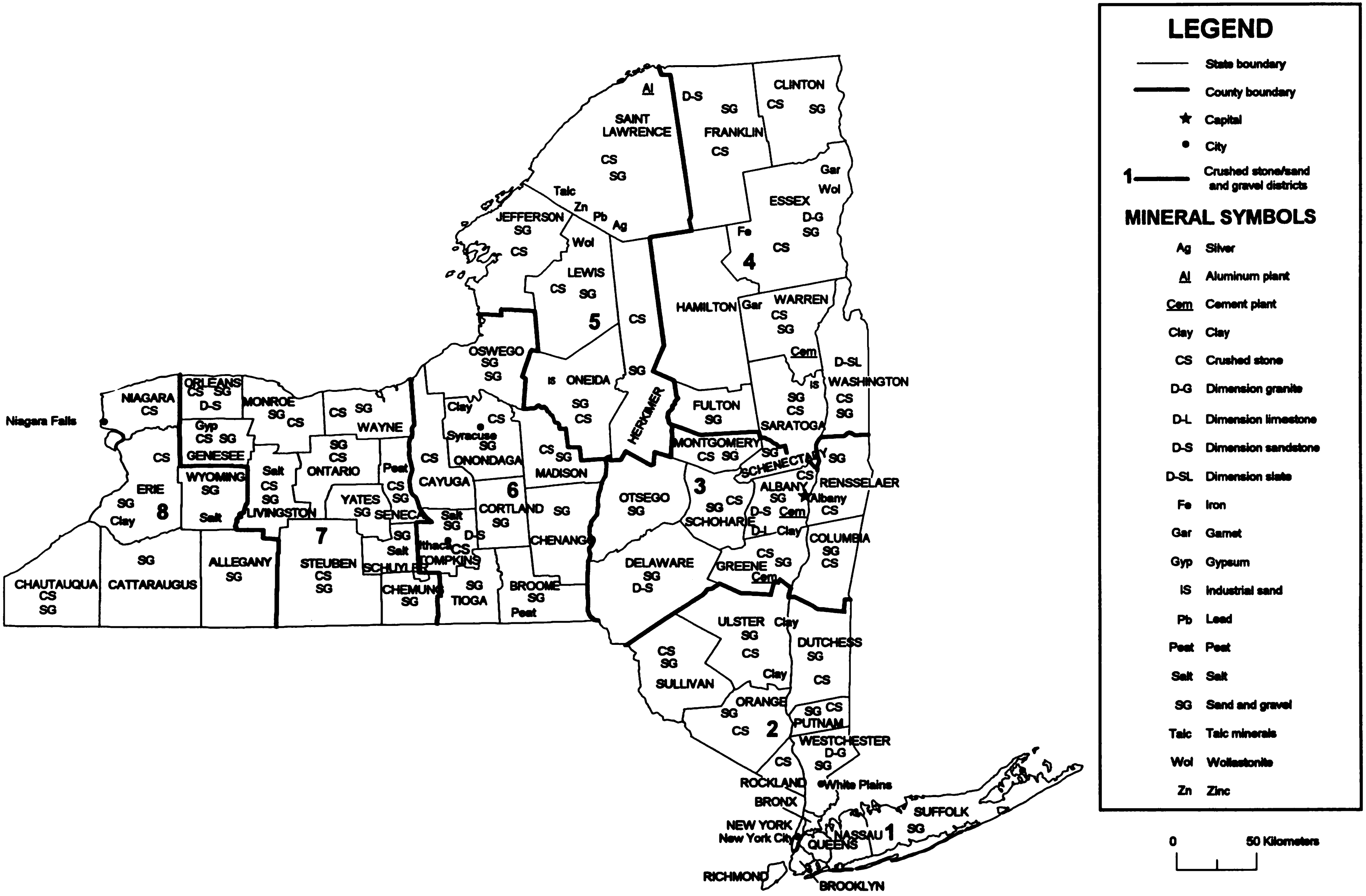
1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes filtration, railroad ballast, and snow and ice control.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

NEW YORK



Source: New York State Geological Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF NEW YORK

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New York State Geological Survey for collecting information on all nonfuel minerals.

In 1996, New York, for the second consecutive year, ranked 15th in the Nation in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $891 million, an increase of 0.6%, or $5 million, from that of 1995. This followed a decrease of smaller magnitude from 1994 to 1995 (based on final 1995 data). The State accounted for more than 2% of the U.S. total nonfuel mineral production value.

In 1996, crushed stone, by value, remained New York's leading nonfuel mineral, followed by portland cement, salt, and construction sand and gravel. About 90% of the State's nonfuel mineral production value came from industrial minerals and mineral products. Primarily, these were (in descending order of value) crushed stone, portland cement, salt, construction sand and gravel, and wollastonite. Zinc accounted for the major portion of metal production and value. Although the State's increase in nonfuel mineral value in 1996 was small compared with that of 1995, there were significant changes in individual commodities. The $28-million combined increase of crushed stone and construction sand and gravel values more than balanced the substantial decrease in the value of salt *(see table 1.)* Compared with 1995, other nonfuel minerals that increased in value in 1996 were as follows: wollastonite, industrial garnet, lead, silver, and peat. Decreases occurred in portland cement, zinc, dimension stone, masonry cement, crude gypsum, and talc. The State's small net decrease in nonfuel mineral value in 1995 mainly resulted from even larger changes in individual commodities than those of 1996. In 1995, substantial decreases in the values of salt and crushed stone plus a relatively small decrease in construction sand and gravel were more than offset by the significant increase in the value of portland cement *(see table 1)* plus smaller increases in wollastonite, zinc, and common clays.

Based on USGS estimates of the quantities produced in the 50 States in 1996, New York remained the only State to produce wollastonite, second of two garnet-producing States, and third in the production of zinc. While the State climbed from fourth to third in the production of talc, it dropped from third to fourth in salt. Additionally, New York mining and mineral processing operations produced significant quantities of crushed stone, portland cement, construction sand and gravel, common clays, dimension stone, and masonry cement.

The following narrative information was provided by the New York State Geological Survey[2] (NYSGS). During 1996, the New York State Department of Environmental Conservation (NYSDEC) issued 312 mining permits. Active mines in New York totaled 2,527, of which 1,828 were operated by members of the mineral industry and the remainder by municipal owners. Total value of the financial security held by New York to guarantee reclamation procedures was nearly $63 million.

The NYSGS reported that the Akzo-Nobel (Retsof) salt mine was completely flooded by early January 1996. Seismic activity and subsidence associated with dissolution of salt in the mine and consequent closure of the mine cavities diminished dramatically. The NYSGS discontinued seismic monitoring in April, completing 24 months of continuous operation of three seismographs. Salt shipments continued from the stockpile. The NYSDEC issued a permit to Akzo-Nobel Salt Inc. to construct a $140-million salt mine at Hampton's Corners, NY, approximately 5 kilometers from the former Akzo salt mine in Retsof, NY. Plans for groundbreaking for a new mine shaft in midyear were abruptly aborted when a decision was made by Akzo-Nobel N.V. of the Netherlands not to construct a new mine in Hampton's Corners. At the time of the decision, a valid mining permit from New York State was in hand and the rights to mine salt under approximately 22,200 hectares (9,000 acres) had been acquired. Test drilling at the new mine site was complete, and a mining plan had been submitted to State and local officials. At the time of the announcement of the decision not to pursue a new mine, the company reported that the Retsof facility would be used as a "distribution center." Salt shipments by way of truck continued from a stockpile throughout 1996. The salt packaging plant operated until the end of the year.

Legislative attention, aroused by the failure of the Akzo-Nobel salt mine, focused on the underground mining industry in New York. Regulatory bills were introduced in both houses of the State Legislature. The proposed legislation rose from the floor of the State Assembly and was introduced in the State Senate as part of the Governor's program. If passed, the proposed legislation would have clarified and expanded the State's jurisdiction over underground noncoal mining in New York State. But ultimately, no legislation was passed into law. In addition, legislative hearings began in the fall of 1996 on a proposed new wollastonite mine at Oak Hill, NY, operated by

NYCO Minerals Inc. NYCO currently operates a wollastonite mine at Lewis, NY. No permit decision had been reached by yearend.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] William Kelly, Associate Scientist with the New York State Geological Survey, authored the text of mineral industry information submitted by that agency.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEW YORK 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	82	6,020	90	7,210	81	6,440
Portland	2,650	139,000	2,530	205,000	2,500	202,000
Clays	507	9,270	563	12,500	563	12,500
Gemstones	NA	W	NA	W	NA	138
Peat	W	12	W	W	W	W
Salt	6,060	233,000	4,480	185,000	3,370	163,000
Sand and gravel (construction)	28,000	138,000	27,300	134,000	28,600	143,000
Stone:						
Crushed	39,400	239,000	39,500	204,000	42,000	223,000
Dimension metric tons	24,600 3/	7,370 3/	32,800	8,440	36,200	7,640
Combined value of garnet (industrial), gypsum (crude), lead, sand and gravel (industrial), silver, stone [dimension granite and quartzite (1994)], talc, wollastonite, zinc, and values indicated by symbol W	XX	117,000	XX	130,000	XX	134,000
Total	XX	889,000	XX	886,000	XX	891,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain stones; value included with "Combined value" data.

TABLE 2
NEW YORK: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	130	$1,370	$10.56
Riprap and jetty stone	286	2,200	7.70
Filter stone	94	689	7.33
Other coarse aggregate	79	653	8.27
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,340	9,650	7.19
Bituminous aggregate, coarse	5,500	29,300	5.33
Bituminous surface-treatment aggregate	727	5,720	7.87
Railroad ballast	46	317	6.89
Other graded coarse aggregate	2,810	21,700	7.73
Fine aggregate (-3/8 inch):			
Stone sand, concrete	137	985	7.19
Stone sand, bituminous mix or seal	821	4,770	5.81
Screening, undesignated	591	3,150	5.32
Other fine aggregate	1,040	7,530	7.26
Coarse and fine aggregates:			
Graded road base or subbase	4,260	25,600	6.00
Unpaved road surfacing	103	881	8.55
Crusher run or fill or waste	2,730	11,100	4.06
Other coarse and fine aggregates	3,480	18,400	5.30
Other construction materials 3/	538	3,950	7.34
Agricultural: Agricultural limestone	82	688	8.39
Chemical and metallurgical:			
Cement manufacture	4,050	15,600	3.85
Lime manufacture	66	1,450	21.92
Special: Other fillers or extenders 4/	2	107	53.50
Unspecified: 5/			
Actual	5,130	18,000	3.50
Estimated	5,500	19,800	3.61
Total	39,500	204,000	5.15

1/ Includes dolomite, granite, limestone, limestone-dolomite, marble, sandstone, slate, and traprock.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes building products, drain fields, and terrazzo and exposed aggregate.

4/ Includes whiting or whiting substitute.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
NEW YORK: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	67	27,400	$142,000 r/	$5.19 r/	63	27,000	$134,000	$4.95
Dolomite	13	7,540	55,800	7.41	12	6,310	41,700	6.61
Granite	11	2,430	20,400	8.37	12	4,230	13,100	3.09
Traprock	2	W	W	11.30	2	W	W	8.08
Sandstone	8	798	5,420	6.79	6	752	4,160	5.54
Marble	1	87	1,610	18.52	1	98	1,850	18.90
Slate	1	W	W	10.80	1	W	W	6.18
Total	XX	39,400	239,000	6.05	XX	39,500	204,000	5.15

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes limestone-dolomite, reported with no distinction between the two.

TABLE 4
NEW YORK: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

	District 2		District 3		District 4		District 5	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 3/	221	2,240	129	965	79	510	W	W
Coarse aggregate, graded 4/	4,960	32,900	2,020	13,700	1,160	7,290	W	W
Fine aggregate (-3/8 inch) 5/	1,330	9,720	441	2,250	W	W	210	1,060
Coarse and fine aggregate 6/	1,340	6,890	1,100	6,640	W	W	1,290	4,930
Other construction materials 7/	52	535	317	2,160	868	5,140	1,110	6,560
Agricultural 8/	2	19	(9/)	(9/)	(9/)	(9/)	(9/)	(9/)
Chemical and metallurgical 10/	--	--	(9/)	(9/)	(9/)	(9/)	(9/)	(9/)
Special 11/	--	--	--	--	--	--	2	107
Unspecified: 12/								
Actual	--	--	--	--	22	136	1,610	6,430
Estimated	1,520	5,200	--	--	--	--	137	469
Total	9,420	57,500	7,400	36,900	2,810	17,600	4,440	21,000

	District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	50	389	W	W	--	--
Coarse aggregate, graded 4/	464	2,850	269	2,070	W	W
Fine aggregate (-3/8 inch) 5/	320	1,860	W	W	W	W
Coarse and fine aggregate 6/	745	3,240	W	W	1,750	11,300
Other construction materials 7/	9	61	3,780	20,000	703	2,700
Agricultural 8/	12	216	13	93	25	234
Chemical and metallurgical 10/	--	--	--	--	--	--
Special 11/	--	--	--	--	--	--
Unspecified: 12/						
Actual	2,040	6,230	1,450	5,160	--	--
Estimated	451	3,100	1,270	3,740	2,110	7,320
Total	4,100	17,900	6,780	31,100	4,590	21,600

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ No crushed stone was produced in District 1.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

7/ Includes building products and drain fields.

8/ Includes agricultural limestone.

9/ Withheld to avoid disclosing company proprietary data; included in "Total."

10/ Includes cement and lime manufacture.

11/ Includes other fillers or extenders and whiting or whiting substitute.

12/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
NEW YORK: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	5,790	$33,800	$5.85
Plaster and gunite sands	278	1,670	6.01
Concrete products (blocks, bricks, pipe, decorative, etc.)	212	1,390	6.57
Asphaltic concrete aggregates and other bituminous mixtures	2,140	10,200	4.78
Road base and coverings 2/	4,790	18,700	3.91
Fill	1,930	5,200	2.70
Snow and ice control	1,210	4,730	3.91
Other 3/	351	2,500	7.11
Unspecified: 4/			
Actual	3,410	15,500	4.56
Estimated	7,210	40,500	5.61
Total or average	27,300	134,000	4.92

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement and lime).

3/ Includes filtration, railroad ballast, and roofing granules.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
NEW YORK: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	1,830	11,700	806	5,500	W	W	201	777
Asphaltic-bituminous mixtures	W	W	198	1,160	W	W	143	404
Road base and coverings 3/	W	W	223	1,360	680	2,750	483	1,640
Fill	W	W	122	429	568	1,270	456	1,410
Snow and ice control	W	W	111	861	219	841	131	411
Other miscellaneous uses 4/	298	2,070	29	300	880	3,670	--	--
Unspecified: 5/								
Actual	290	2,010	54	533	415	1,770	3	5
Estimated	1,380	14,100	836	3,850	11	26	751	2,930
Total	3,800	29,900	2,380	14,000	2,770	10,300	2,170	7,580

Use	District 5		District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	260	1,160	1,640	10,500	657	3,340	W	W
Asphaltic-bituminous mixtures	W	W	717	4,000	525	2,430	463	1,840
Road base and coverings 3/	W	W	1,110	3,660	1,070	4,340	939	4,030
Fill	W	W	354	839	145	303	54	183
Snow and ice control	60	197	396	1,450	164	614	W	W
Other miscellaneous uses 4/	405	1,290	74	335	101	447	179	761
Unspecified: 5/								
Actual	173	761	546	2,270	87	156	1,840	8,030
Estimated	491	1,740	749	4,050	1,270	6,040	1,730	7,770
Total	1,390	5,150	5,590	27,100	4,010	17,700	5,200	22,600

W Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses."

1/ Data are rounded to three significant digits; may not add to totals shown.

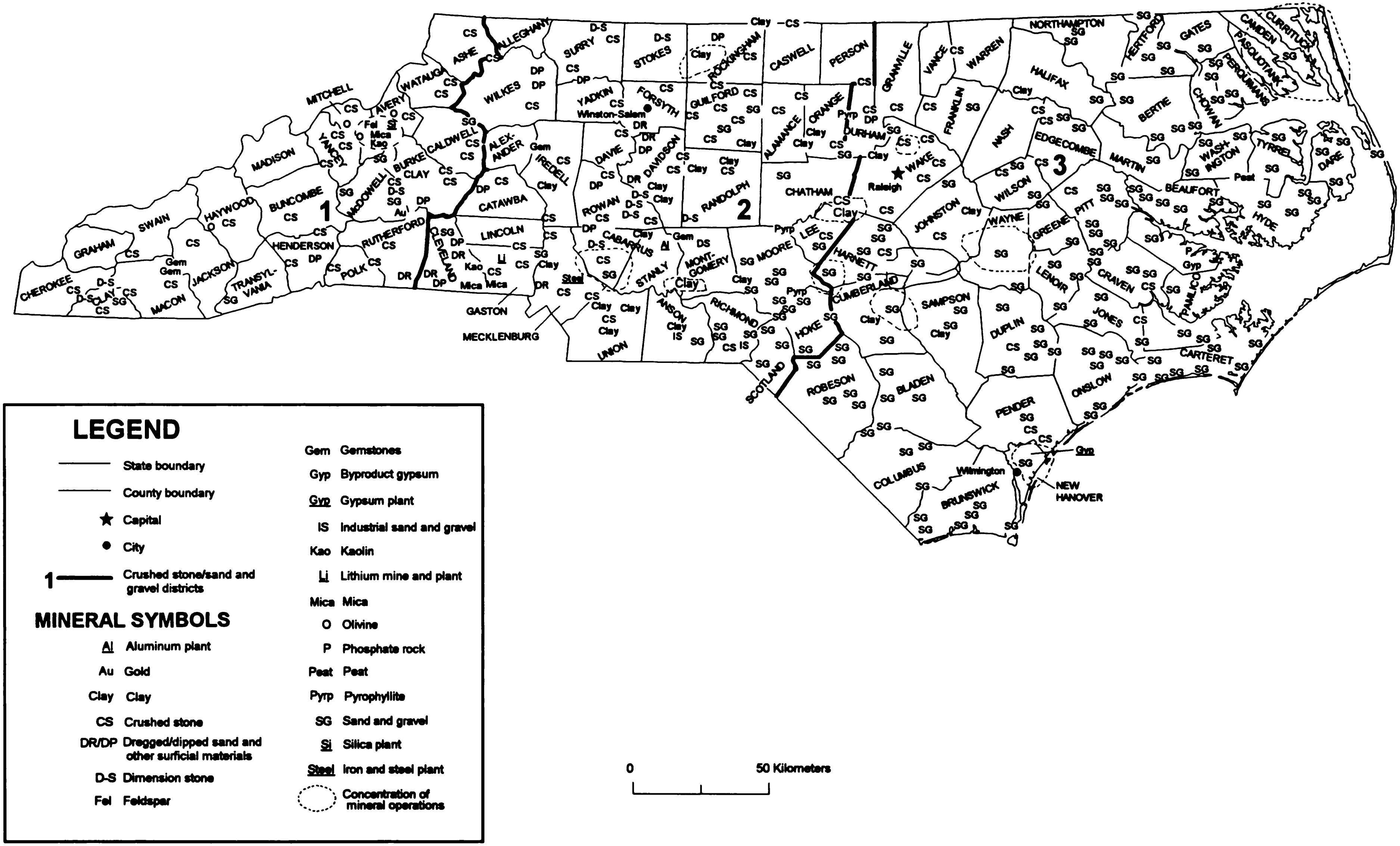
2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement and lime).

4/ Includes filtration and railroad ballast, and roofing granules.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

NORTH CAROLINA



Source: North Carolina Geological Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF NORTH CAROLINA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the North Carolina Geological Survey for collecting information all nonfuel minerals.

In 1996, North Carolina ranked 18th nationally in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The State was 17th in 1995. The estimated value for 1996 was $731 million, a less than 1% decrease from that of 1995. This followed a gain of about 4.6% from 1994 to 1995 (based on final 1995 data). The State accounted for 2% of the U.S. total nonfuel mineral production value.

In 1996, the combined values of construction and industrial sand and gravel and crushed stone increased the State's nonfuel mineral value by more than $17 million. But decreases in phosphate rock and gemstone values more than offset those increases, resulting in a small net loss for the year. Compared with 1995, the other mineral commodity values that increased in 1996 were those of feldspar, dimension stone, crude mica, and talc and pyrophyllite. Other nonfuel minerals that decreased in value in 1996 included lithium minerals, common clays, olivine, and peat. In 1995, the values of crushed stone, lithium minerals, and gemstones, from the largest increase to the smallest, led the way in the year's increase, which was moderated somewhat by decreases in phosphate rock and industrial sand and gravel.

Compared with USGS estimates of the quantities produced in the other 49 States, North Carolina remained the leading State in feldspar and crude mica; first of two States that produced lithium minerals and olivine; second in phosphate rock; fifth in talc and pyrophyllite; seventh in kaolin; and ninth in dimension stone. While the State rose from seventh to sixth in industrial sand and gravel, it decreased from first to third in common clays, and from eighth to ninth in crushed stone. In addition, significant quantites of construction sand and gravel were produced in the State. North Carolina mines have been producers of industrial minerals exclusively since the early 1970's, particularly since the 1971 closing of the Tungsten Queen Mine, an underground tungsten mine in Vance County. Metal production in the State, especially that of primary aluminum, resulted from the processing of recycled materials or raw materials received from other domestic and foreign sources.

The following narrative information was provided by the North Carolina Geological Survey (NCGS) and includes mineral industry information and news for both 1995 and 1996 (Reid, 1997). Common clays mined from residual soils (saprolite) developed on crystalline rocks and mudstones from Triassic basins provide the basis for the State's brick industry. According to the Brick Association of North Carolina, North Carolina ranks first in brick production. Thirteen companies produced more than 950 million units in 1995, worth approximately $126 million. These manufacturers supply 16% of all the brick used in the United States. Material preferences for new home construction in North Carolina in 1995 were as follows: brick (33%), wood siding (26%), vinyl (13%), artificial stucco (11%), and other (17%).

According to the North Carolina Division of Land Resources (DLR), the State recorded overall increases in most phases of mining activity in 1995. These included increases in the number of mining permits issued, number of hectares permitted, and the total number of mines. In 1995, there were 795 permitted active and inactive mines. Sixty-two percent of these mines was sand and gravel, 16% crushed stone, 5% brick clay, 3% dimension stone, and the remaining 14% was from a variety of other commodities. By the end of 1995, 41,790 hectares were permitted: 32% phosphate, 31% crushed stone, 23% sand and gravel, 5% brick clay, and the remaining 9% was composed of various other commodities. Forty-nine new mining permits were issued in 1995: sand and gravel (40), sand dredging (3), crushed stone (2), dimension stone (2), gemstone (1), and clay (1).

In 1995, the NCGS, the Minerals Research Laboratory (MRL) of North Carolina State University, and the Carolinas' section of the Society of Mining Engineers provided an exhibit entitled "Mining and Minerals in Society" at the State Science Teachers Meeting. More than

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

18 metric tons[2] of rock and mineral specimens were distributed to the attendees. In a similar program entitled "Down to Earth," the MRL made more than 40 presentations to nearly 500 students in western North Carolina schools. Approximately 400 mineral kits, used for education purposes in the classrooms, were distributed. In 1996, the MRL and the NCGS received a grant of $10,000 to produce and distribute up to 800 additional rock kits for use in the public schools. The Colburn Gem & Mineral Museum, Asheville, NC, contains photographic murals on historical mining and on gold mining in North Carolina, covering the major mineral industries. The museum also has ore and product samples and photographs of mining operations.

Potash Co. of Saskatchewan Inc. (formerly Texasgulf Inc.), in Aurora, operated the largest single-site, vertically integrated phosphate mine and chemical processing complex in the world. Phophate is an important raw material for the fertilizer industry.

FMC Corp., Lithium Division, mines spodumene, a lithium ore near Bessemer City, NC. FMC is developing a large lithium brine operation in Argentina. Upon completion of this project, FMC intends to phase out its mining operation in North Carolina. Portions of FMC's chemical plant in Gastonia will continue to operate.

Unimin Corp. is spending more than $50 million on new construction in the Spruce Pine area. The kaolin plant, once owned by Blue Diamond Coal Co., has been demolished, and a new modern floatation plant and quartz leaching plant now occupies the site on which the kaolin plant stood. This plant is slated for startup sometime in January 1997.

Feldspar Corp., a division of Zemex Corp. (Canada), continues to renovate and expand its plant at Spruce Pine. New dry gravity facilities have been installed, and a new floatation plant has been erected.

Exploration for gold and base metals remained at low levels. The U.S. Forest Service reports that the drilling activity begun in 1994 by Battle Mountain Gold Co./Cominco Ltd. and ASARCO Incorporated in the Uwharrie National Forest has been completed. There have been no new requests for drilling in this area. BHP Minerals Ltd. conducted stream sediment geochemical surveys on U.S. Forest Service lands in western North Carolina during 1995.

Becker Minerals Inc. received the North Carolina Mining Commission's annual reclamation award for its reclamation project on a 485-hectare site which included previously mined areas, future mineral reserves, the plant site, waste areas, and buffer areas. During the life of the sand and gravel operator, 172 hectares were mined; only 97 hectares were required to be reclaimed according to the State's mining law. Becker has completed reclamation of all land affected by mining with the exception of a 4-hectare area, which was scheduled for completion by early 1997. The company was selected for the award because of its initiative to upgrade its reclamation plan through innovative land planning. The company's reclamation efforts included a variety of land uses such as agriculture, forestry, residences, wildlife habitat, and recreation at the site. The project also received an honorable mention from the Interstate Mining Compact Commission's national annual awards program.

There are currently no proposed mineral exploration projects in National Forests in North Carolina. Most of the Bureau of Land Management (BLM) prospecting permits on the Uwharrie have been dropped. Vengence Creek Stone Co. has been approved for a 5-year plan of operation to mine quartzite building stone in Cherokee County. The company expects to remove approximately 3,600 tons per month. There was no production in 1995. One lease applicant dropped his BLM lease request to mine gold at the site of the old Tebe Saunders Mine in the Uwharrie National Forest and has reclaimed his exploration worksite.

During fiscal year 1996 (July 1 to June 30), the National Forests in North Carolina sold 75,657 tons of crushed stone and dimension stone for a value of $33,927. Most of this came from two long-term use sites: the Massey Branch quarry in Graham County produced crushed aggregate (72,000 tons), and the Hall Mine in Montgomery County produced building stone. Several other quarries were still in the permit approval process at yearend.

The DLR Land Quality Section (LQS) , in cooperation with the Mining Commission, recently published the Surface Mining Manual, a guide for permitting, operation, and reclamation. The manual is meant to help mining permit applicants to properly complete applications so that the applications can be processed in a more timely manner. It is also meant to help mine operators understand the operation and reclamation conditions of their permits. The manual contains easily understandable information regarding (1) North Carolina State laws and rules, (2) mining applications and operating permits, (3) reclamation plans and bonds, (4) State inspections and monitoring, (5) recordkeeping, (6) compliance and penalties, and (7) Federal and State agency contacts and reference guides. The manual is available and may be purchased from the LQS. Its price for instate addresses is $50.00; for out-of-State addresses, the price is $70.00.

The Mining Act of 1971 (G.S. 74-46 to G.S. 74-74) requires that any person or firm wishing to engage in mining that will affect 0.4 hectare (1 acre) or more in surface area must first obtain a valid State mining permit. The LQS administers the Mining Act. It also administers the Dam Safety law of 1967 and Sedimentation Pollution Control Act of 1973. Other permits that may pertain to mineral extraction and processing, including air and water permits, are issued by North Carolina's Divisions of Air Quality and Water Quality, respectively. Questions about the Mining Act of 1971 and permit fees should be directed to the State Mining Specialist, Land Quality Section, Division of Land Resources, Department of Environment, Health, and Natural Resources (DEHNR), P.O. Box 27687, Raleigh, NC 27611-7687. The telephone number is (919) 733-4574. The fax number is (919) 733-2876.

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[2] All tons are metric unless otherwise specified.

The DEHNR published a guide to environmental regulations entitled "the 1994 North Carolina Environmental Permit Directory," a general introduction to environmental regulations and an overview of requirements governing the wise use and protection of the state's natural resources." It is available from DEHNR's Small Business Omsbudman/Environmental Permit Center (EPIC), P.O. Box 27626-0583, Raleigh, NC 27611-7687 at a cost of $7.00 (plus 6% sales tax for sales in the State). The telephone number is (919) 733-1267; the toll free helpline is (888) 368-2640. A free summary brochure contains a permit matrix. EPIC is a center for environmental permit information. Its staff helps businesses and people identify the permits they need and refers them to the appropriate DEHNR agency to help get them started. The staff also coordinates preapplication conferences, where many permit questions can be answered. EPIC can be reached by e-mail at epic@owr.ehnr.state.nc.us.

The NCGS provides basic geologic information. Current studies include geologic mapping, stratigraphic framework studies, mineral resource investigations, and environmental and engineering studies. The NCGS maintains a sample repository which includes drill core, cuttings, and geophysical bore hole records. Descriptions of the repository contents are in a computer database to facilitate information retrieval. The NCGS has a modern heavy-minerals laboratory. Reports of investigations are available from the NCGS. A new index to topographic maps was published in 1996.

The NCGS has various publications on mineral commodities including asbestos minerals and talc, building stone, clay, feldspar, gold, heavy minerals, high-alumina-minerals, limestone, lithium, other industrial minerals, phosphate, silica, and titanium. Current investigations are in progress for feldspar, gold, and mica. These reports and guidebooks focus on different mineral producing districts in North Carolina. The NCGS also has geologic maps at several scales but only about 6% of the State is covered by 1:24,000-scale geologic mapping. Limited funding from the recent passage of the National Geologic Mapping Act will help marginally to accelerate the rate of geologic mapping of the State at the scale of 1:24,000.

Funds were identified recently to authorize work to complete digital quarterquad (DOQQ) coverage for the entire State. The leaf-off black and white photography was taken in 1993. Pixel resolution is about 1 to 3 meters. By yearend 1996, more than 1,000 DOQQ's, or about 33% of the State, had been received. The initial focus has been the coastal counties and the Piedmont crescent; these are being converted to a format compatible with a broader number of geographic information systems as time and resources permit.

Applied minerals research is conducted by the MRL. It develops new and improved processes to extract minerals from ore deposits and conducts research for the development of mineral resources in North Carolina, other States, and foreign countries. Projects are undertaken as sponsored (fee basis) or State-supported projects. The laboratory conducts sponsored and unsponsored beneficiation projects on many commodities, especially industrial minerals. The laboratory can conduct a wide variety of mineral dressing and pilot-plant studies. Its facilities include mineral processing equipment and analytical support facilities for batch and continuous pilot-plant research to develop workable flowsheets and to produce large samples for customer evaluation.

The MRL has been active in several major research projects investigating deposits in the State containing quartz, feldspar, and mica. Activity on mica has been especially heavy, indicating an increase in its use and shortage of sources. Two cooperative investigations between the MRL and the NCGS were recently published. These include investigation of muscovite mica in greisen rock of the Sims granitoid intrusive, Wilson County, North Carolina (NCGS Information Circular 30), and potential feldspar resources in north-central North Carolina (NCGS Open-File Report 95-1).

With the closure of the U.S. Bureau of Mines in the region (Tuscaloosa Alabama Research Center) and the pending changes in the Minerals Department of the University of Alabama, the MRL emerges as one of the few minerals processing research groups remaining in the Southeastern United States. To enhance its research capabilities, MRL has obtained laboratory and pilot-plant equipment from the former U.S. Bureau of Mines and the University of Alabama.

Examples of current MRL projects include a multiphase project to characterize fly ash produced by utilities, fly ash beneficiation, testing fly ash use in asphalt and concrete mixes, and economic analysis. Recently, a study of various glazed, decorative effects on artware using natural minerals for stains (chromite, dolomite, magnetite, etc.) to help small potters was completed. Further information can be obtained from the Office of the Director, North Carolina State University Minerals Research

Laboratory, 180 Coxe Ave., Asheville, NC 28801. The telephone number is (704) 251-6155; the fax number is (704) 251-6381.

North Carolina State University's Analytical Instrumentation Facility (AIF), part of the Engineering Research Services Division, has a modern, well-equipped laboratory. It contains state-of-the-art analytical instruments which are available to characterize and to analyze a wide variety of materials. Prospective users should contact AIF at (919) 515-7501 to discuss material analysis and prices of analytical services. The address is Box 7531, Raleigh, NC 27695-7531.

For more information about the State's geology, mineral resources, topographic maps, orthophotoquadrangles, and remotely sensed data, contact the North Carolina Geological Survey, P.O. Box 27687, Raleigh, NC 27611-7687. The telephone number is (919) 733-2423; the fax number is (919) 733-0900.

The NCGS also has complete State coverage of topographic maps and orthophotoquadrangles; a publication list on the geology and mineral resources of the State is available upon request. An index showing map coverage is available. Maps may be ordered by telephone (919-733-2423), by mail (North Carolina Geological Survey, P.O. Box 27687, Raleigh, NC 27611-7687), or at the 5th floor Archdale Building office (512 North Salisbury St., Raleigh). Currently the NCGS' Internet site (http://www.enhr.state.nc.us/EHNR/DLR/JEFF/rock.htm) has more than 18 key areas of interest, including links to many earth science web sites and its entire publication list.

Reference Cited

Reid, J.C., Carpenter, R.H., Davis, T.E., and Sample, T.L., 1997, Permitted active and inactive mining operations in North Carolina as of November 1996: North Carolina Geological Survey Open File Report 97-1, 198 p.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN NORTH CAROLINA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

	1994		1995		1996 p/	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays 3/	2,530	12,500	2,430	12,500	2,400	11,100
Feldspar	488	176	497	18,400	509	18,900
Gemstones	NA	565	NA	4,440	NA	680
Mica (scrap)	68	3,270	74	3,690	W	W
Peat	21	W	19 4/	340 4/	W	W
Sand and gravel:						
Construction	11,100	50,700	10,100	50,100	11,300	58,400
Industrial	1,460	24,200	1,330	21,900	1,640	26,900
Stone:						
Crushed	53,900 5/	351,000 5/	57,300	384,000	57,000	388,000
Dimension metric tons	33,700 5/	12,500 5/	41,100 5/	15,400 5/	48,500	16,000
Combined value of clays (kaolin), lithium minerals, olivine, phosphate rock, stone [dimension quartzite, sandstone, slate and miscellaneous (1994-95)], pyrophyllite, and values indicated by symbol W	XX	231,000 r/	XX	225,000	XX	211,000
Total	XX	703,000 r/	XX	735,000	XX	731,000

p/ Preliminary. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data.

XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; value included with "Combined value" data.

4/ Data series changed to production beginning in 1995; prior years shipment data may not be comparable.

5/ Excludes certain stones; value included with "Combined value" data.

TABLE 2
NORTH CAROLINA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	W	W	$7.05
Riprap and jetty stone	720	$5,880	8.17
Filter stone	469	3,240	6.92
Coarse aggregate, graded:			
Concrete aggregate, coarse	4,580	33,700	7.36
Bituminous aggregate, coarse	2,320	18,600	8.00
Bituminous surface-treatment aggregate	336	2,210	6.57
Railroad ballast	1,460	7,140	4.90
Other graded coarse aggregate	W	W	7.56
Fine aggregate (-3/8 inch):			
Stone sand, concrete	139	794	5.71
Stone sand, bituminous mix or seal	600	3,160	5.26
Screening, undesignated	2,080	11,500	5.56
Other fine aggregate	W	W	4.83
Coarse and fine aggregates:			
Graded road base or subbase	10,300	57,200	5.54
Unpaved road surfacing	285	1,740	6.09
Terrazzo and exposed aggregate	W	W	11.12
Crusher run or fill or waste	845	4,900	5.79
Other coarse and fine aggregates	W	W	6.45
Other construction materials 3/	981	7,460	7.61
Agricultural:			
Agricultural limestone	(4/)	(4/)	5.56
Poultry grit and mineral food	(4/)	(4/)	5.00
Other specified uses not listed	(4/)	(4/)	6.46
Unspecified: 5/			
Actual	30,300	214,000	7.05
Estimated	1,400	9,410	6.74
Total	57,300	384,000	6.69

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Includes calcareous marl, dolomite, granite, limestone, miscellaneous stone, quartzite, slate, traprock, and volcanic cinder and scoria.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes drain fields.

4/ Withheld to avoid disclosing company proprietary data; included in "Total."

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
NORTH CAROLINA: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	12	4,290	$30,000	$6.98	12	5,680	$38,800	$6.83
Dolomite	1	245	1,680	6.87	1	265	1,820	6.86
Calcareous marl	3	111	738	6.65	3	135	942	6.98
Granite	69 r/	41,700 r/	267,000 r/	6.40	71	43,100	285,000	6.62
Traprock	7	3,930	25,800	6.57	7	4,540	30,600	6.74
Slate	3	W	W	6.95	2	W	W	7.39
Volcanic cinder and scoria	1	W	W	7.04	1	W	W	7.21
Quartzite	2 r/	W	W	6.44 r/	2	W	W	6.70
Miscellaneous stone	1 r/	W	W	7.28 r/	2	W	W	7.28
Total	XX	53,900	351,000	6.51	XX	57,300	384,000	6.69

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 4
NORTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 2/	445	3,530	W	W	W	W
Coarse aggregate, graded 3/	W	W	W	W	1,610	10,700
Fine aggregate (-3/8 inch) 4/	W	W	W	W	394	2,020
Coarse and fine aggregate 5/	3,830	23,000	W	W	W	W
Other construction materials 6/	3,530	23,300	12,500	79,700	2,800	15,300
Agricultural 7/	(8/)	(8/)	--	--	(8/)	(8/)
Other miscellaneous uses 9/	(8/)	(8/)	(8/)	(8/)	--	--
Unspecified 10/						
Actual	437	2,720	(8/)	(8/)	(8/)	(8/)
Estimated	258	1,820	151	1,070	988	6,530
Total	8,620	55,100	30,400	204,000	18,400	124,000

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, and riprap and jetty stone.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

5/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

6/ Includes drain fields.

7/ Includes agricultural limestone and poultry grit and mineral food.

8/ Withheld to avoid disclosing company proprietary data; included in "Total."

9/ Includes other specified uses not listed.

10/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
NORTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate and concrete products 2/	3,980	$14,900	$3.75
Asphaltic concrete aggregates and other bituminous mixtures	590	1,970	3.34
Road base and coverings 3/	664	3,020	4.55
Fill	877	2,250	2.57
Snow and ice control	30	154	5.13
Other 4/	823	6,760	8.22
Unspecified: 5/			
Actual	2,130	17,100	8.05
Estimated	1,010	3,910	3.86
Total or average	10,100	50,100	4.96

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (lime).

4/ Includes filtration and railroad ballast.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
NORTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	348	2,380	1,510	5,120	2,120	7,410
Asphaltic concrete aggregate and road base materials 3/	484	2,580	392	1,500	1,280	3,320
Other miscellaneous uses 4/	269	1,240	512	5,290	42	230
Unspecified: 5/						
Actual	--	--	1,130	11,700	993	5,400
Estimated	208	1,080	296	1,110	511	1,730
Total	1,310	7,290	3,840	24,700	4,950	18,100

1/ Data are rounded to three significant digits; may not add to totals shown.

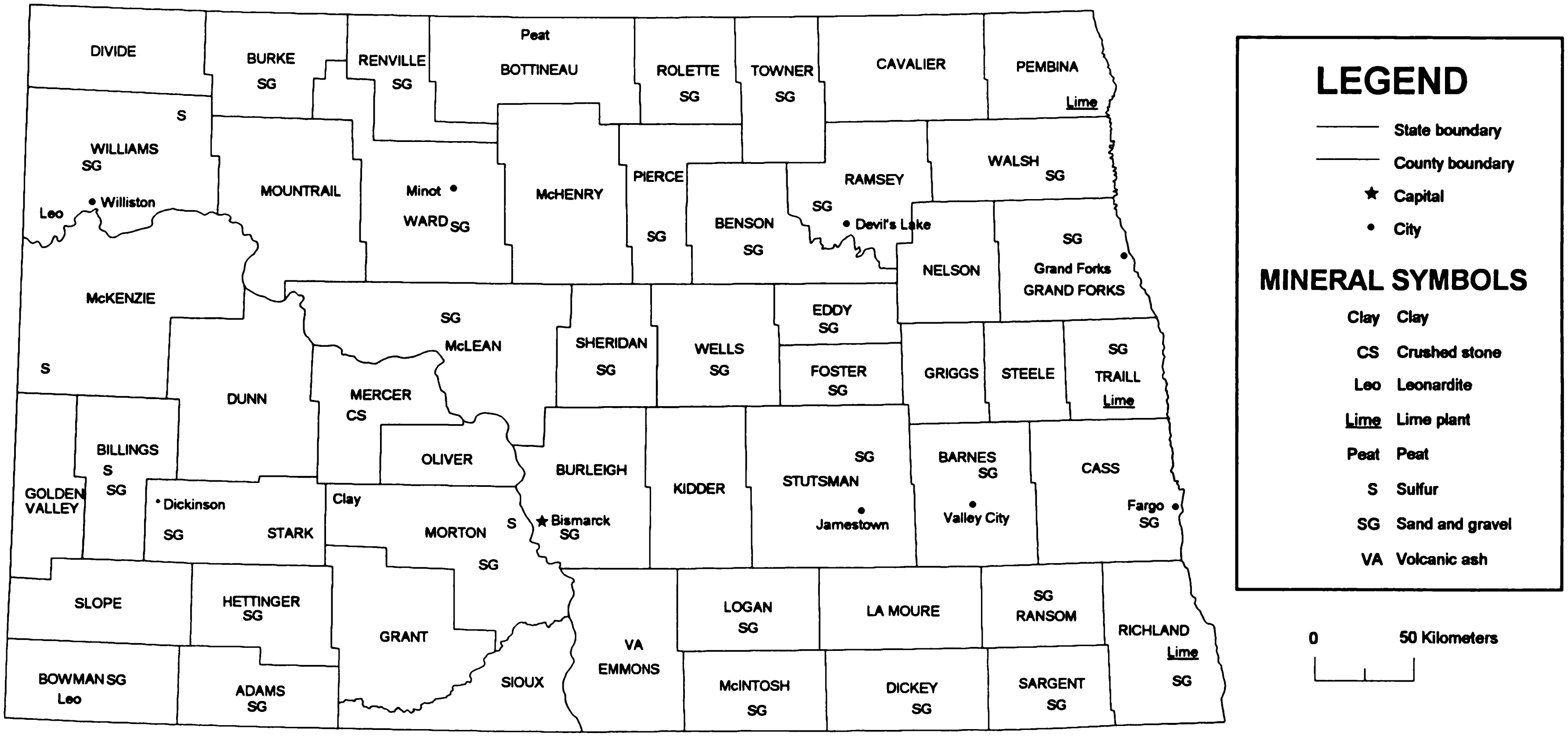
2/ Includes plaster and gunite sands.

3/ Includes fill, road and other stabilization (lime), and snow and ice control.

4/ Includes filtration and railroad ballast.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

NORTH DAKOTA



Source: North Dakota Geological Survey/U.S. Geolgical Survey

THE MINERAL INDUSTRY OF NORTH DAKOTA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the North Dakota Geological Survey for collecting information on all nonfuel minerals.

In 1996, North Dakota ranked 49th in the Nation in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The State was 48th in 1995. The estimated value for 1996 was $30 million, a 3% decrease from that of 1995. This followed a 23% increase from 1994 to 1995 (based on final 1995 data). The State accounted for about one-tenth of 1% of the U.S. total nonfuel mineral production value.

North Dakota's mine pits produced significant quantities of construction sand and gravel, the State's leading nonfuel mineral by value. This high-volume, low-value mineral commodity accounted for nearly 81% of the State's nonfuel mineral production value. Compared with 1995, construction sand and gravel increased in value in 1996, while lime showed a decrease for the year. In 1995, construction sand and gravel was responsible for most of the State's increase in total nonfuel mineral production value.

The following narrative information was provided by the North Dakota Geological Survey[2] (NDGS). Lime, produced as a byproduct in the State's three sugar beet refineries, was the second principal nonfuel mineral commodity produced in the State. Elemental sulfur recovered from oil refineries and gas processing plants, though not included in USGS statistics, was an important part of North Dakota's mineral economy. Elemental sulfur and other byproducts (krypton, xenon, anhydrous ammonia, ammonium sulfate, carbon dioxide, and liquid nitrogen) were recovered at fuel mineral operations including facilities for the processing of natural gas and the gasification of coal.

In the summer of 1996, a coal gasification plant at Beulah went on-line with an anhydrous ammonia plant that was capable of producing 1,100 metric tons[3] per day. The plant had been dismantled and shipped from Davenport, IO. A unique scrubber system was recently installed at the newly relocated plant that uses anhydrous ammonia and water in combination with flue gas to produce ammonium sulfate. The plant was projected to produce 500 tons of ammonium sulfate per day.

The NDGS completed a report on the State's Glauber's salt (sodium sulfate) reserves in the northwestern corner of the State. The project involved drilling at several lakes and incorporating this subsurface information with previous data reported by the Federal Emergency Relief Administration, the U.S. Bureau of Mines, and industry. The NDGS estimated that 42 million tons of Glauber's salt were present beneath 15 lakes in the northwest part of the State. A new development in this industry has been the concept of converting sodium sulfate to sodium bicarbonate by the addition of carbon dioxide and anhydrous ammonia. Ammonium sulfate is a byproduct of this procedure, but, as of yearsend, no commercial development of this technology had begun.

The NDGS continued entering all of the geologic information from its subsurface mineral program into a computerized spreadsheet. This information will be used for a number of purposes including redefining the State's uranium deposits.

In 1995, the NDGS published a general guide to the State's clay resources which included a historical review of clay utilization in the State. Also in 1995, the Hebron Brick Co., the only manufacturer of bricks in North Dakota, accounted for 75% of the clay mined in the State.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. Construction sand and gravel estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Edward C. Murphy, Geologist, authored the text of State mineral industry information submitted by the North Dakota Geological Survey.

[3] All tons are metric unless otherwise specified

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NORTH DAKOTA 1/ 2/

(Thousand metric tons and thousand dollars)

	1994		1995		1996 p/	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays	59	W	59	W	59	W
Lime	W	6,590	W	W	W	W
Sand and gravel (construction)	6,810	18,500	8,420	23,900	8,500	24,500
Combined value of clays (common), gemstones, peat, sand and gravel (industrial), and values indicated by symbol W	XX	199	XX	7,300	XX	5,840
Total	XX	25,300	XX	31,200	XX	30,300

p/ Preliminary. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 2
NORTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate and concrete products 2/	420	$2,670	$6.35
Asphaltic concrete aggregates and other bituminous mixtures	381	1,150	3.02
Road base and coverings 3/	2,470	6,140	2.48
Fill	50	102	2.04
Snow and ice control	6	22	3.67
Other	21	134	6.38
Unspecified: 4/			
Actual	46	120	2.61
Estimated	5,030	13,500	2.69
Total or average	8,420	23,900	2.83

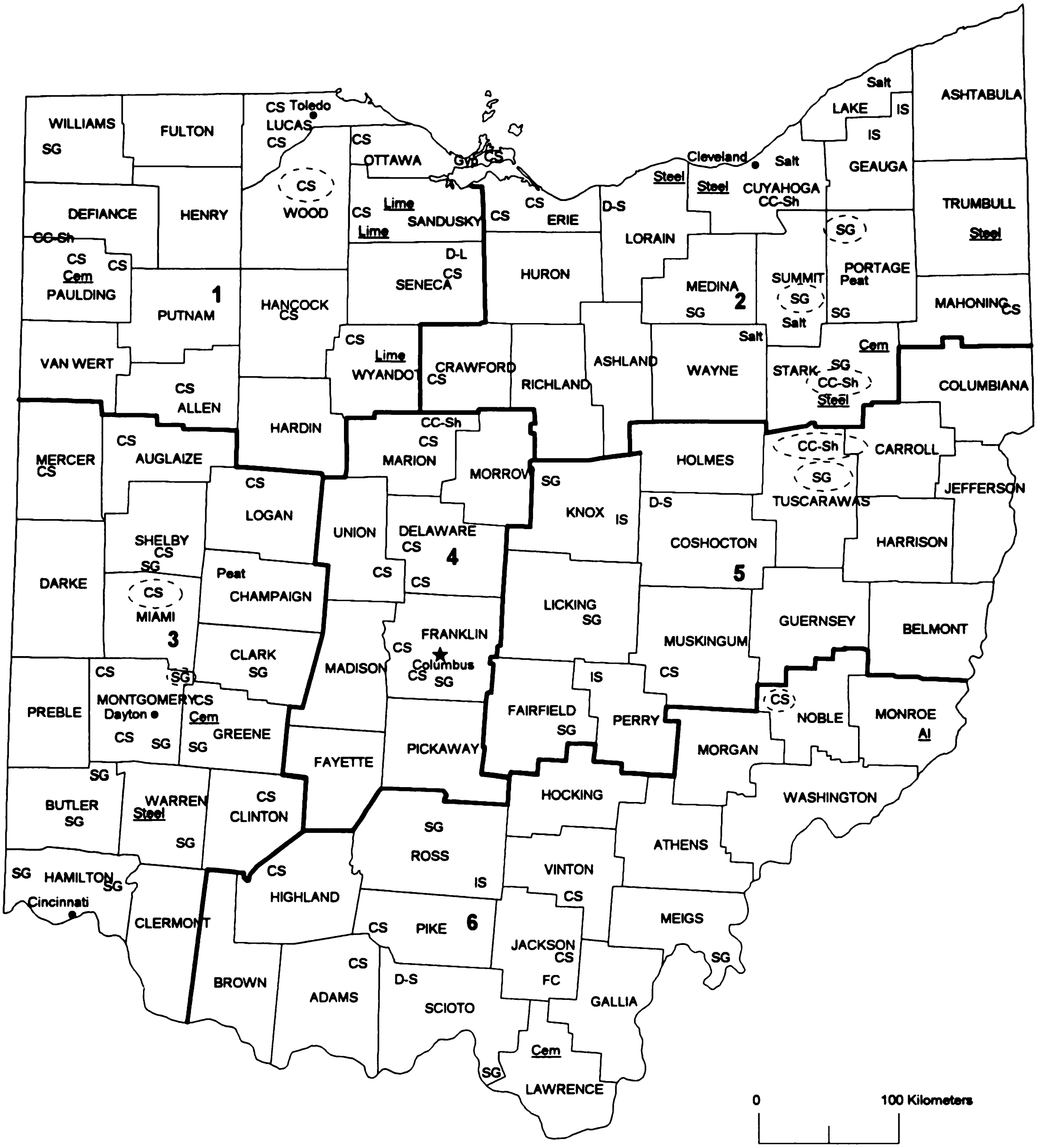
1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement).

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

OHIO



LEGEND

- State boundary
- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS

Al	Aluminum plant	D-S	Dimension sandstone	Lime	Lime plant
CC-Sh	Common clay and shale	FC	Fire clay	Peat	Peat
Cem	Cement plant	Gyp	Gypsum	Salt	Salt
CS	Crushed stone	IS	Industrial sand	SG	Sand and gravel
D-L	Dimension limestone	( )	Concentration of mineral operations	Steel	Iron and steel plant

Source: Ohio Division of Geological Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF OHIO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Ohio Division of Geological Survey for collecting information all nonfuel minerals.

Ohio ranked 13th in the Nation in total nonfuel mineral production value[1] in 1996, climbing from 14th in 1995, according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $934 million, an increase of about 5% compared with the $890 million of 1995. This followed an increase of more than 1% from 1994 to 1995 (based on final 1995 data). The State accounted for nearly 2.5% of the U.S. total nonfuel mineral production value.

In 1996, Ohio's increased nonfuel mineral value was attributable to significant increases in the values of salt and crushed stone and, relative to these changes, moderate increases in lime and construction sand and gravel. Compared with that of 1995, other values that increased in 1996 were: industrial sand and gravel, crude gypsum, and peat. Decreases occurred in portland and masonry cements and dimension stone. During 1995, the increase in crushed stone value together with smaller increases in portland cement and lime were, for the most part, responsible for the year's increased value.

Based on USGS estimates of the quantities produced in the United States during 1996, Ohio remained second in the production of lime, fourth in construction sand and gravel and common clays, and eighth in industrial sand and gravel. While the State climbed from fourth to third in salt, it dropped from sixth to seventh in the production of crushed stone. Additionally, significant quantities of portland and masonry cement were produced in the State. The State's mines exclusively produce industrial minerals and coal; any metals, especially steel and aluminum, produced in the State are processed from materials received from other domestic and foreign sources. Ohio continued to be the Nation's second leading raw steel-manufacturing State with an estimated output of almost 15.3 million metric tons[2] of raw steel, as reported by the American Iron and Steel Institute. The State remained the fourth leading producer of primary aluminum in the Nation in 1996.

The following narrative information was provided by the Ohio Department of Natural Resources, Division of Geological Survey[3] (DGS). The combined output of construction aggregates—crushed limestone, crushed sandstone, and sand and gravel—was estimated by the DGS to reach 109 million tons in 1996. DGS attributed this record-setting production level to an increase in the construction of commercial buildings and highways and increases in highway repair.

Regarding developments in the mineral industry in 1996, several new crushed limestone quarries were opened in southwestern Ohio. These new quarries will make crushed stone available to the growing Cincinnati area. American Aggregates Corp. also was anticipating a change in management from the Australian-based CSR American Aggregates, its current owner. In the beginning of the year, the sand and gravel and crushed limestone operations of Dravo Basic Materials Co., Inc., were purchased by Martin Marietta Aggregates. Near the end of the year, Cargill Salt Co. negotiated with Akzo Nobel Salt, Inc., to purchase all of Akzo's North American salt operations including those based in Ohio.

Also potentially significant to Ohio's aggregate industry was a change in its leadership. The Ohio Aggregates Association (Ohio's trade association for aggregate producers) had been under the direction of one managing director for the past 20 years. A new executive, having a background in law and in handling legislative affairs and environmental compliance, became the new managing director.

The DGS reported that three issues were likely to have the most effect on Ohio's aggregate industry in 1997. The first was the decentralization of the Ohio Department of Transportation (ODOT). By giving the 12 ODOT districts more responsibility, consistency of material specifications throughout the State could become an issue. Second is that of the Federal Government "super pave" program. In Ohio, this highway construction material and specifications program is being discussed in relation to State highway construction projects. Under super pave specifications, different shapes and quantities of a material may be required for highway pavement as compared to the current practice. This would require aggregate producers to change how they crush rock. The third topic is that of the "New Source Performance Standards" (NSPS.) The NSPS is a body of environmental regulations from the Ohio Environmental Protection Agency that looks at the air quality of emissions from nonmetallic mineral processing plants of multi-State operations. In particular, NSPS would target fugitive emissions (dust) from transfer points, such as crushers, conveyors, and bagging operations.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by

producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (e.g., construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] All tons are metric tons unless otherwise specified.

[3] Sherry Weisgarber, Geologist and Mineral Statistician at the Ohio Division of Geological Survey, authored the text of Ohio minerals industry information.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN OHIO 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994 Quantity	1994 Value	1995 Quantity	1995 Value	1996 p/ Quantity	1996 p/ Value
Cement (portland)	1,050	69,700	1,050	72,700	1,030	71,300
Clays	2,080 3/	12,500 3/	1,930	10,700	2,110	9,090
Gemstones	NA	43	NA	3	NA	3
Lime	1,850	113,000	1,920	117,000	2,030	124,000
Sand and gravel:						
Construction	47,700	205,000	45,300	196,000	45,900	201,000
Industrial	1,260	27,700	1,270	28,800	1,480	31,600
Stone:						
Crushed	56,400	251,000	60,900	265,000	62,600	279,000
Dimension metric tons	W	W	17,900	1,670	18,800	1,610
Combined value of cement (masonry), clays [ball (1994)], gypsum (crude), peat, salt, stone [dimension limestone and sandstone (1994)], and value indicated by symbol W	XX	201,000	XX	200,000	XX	217,000
Total	XX	880,000	XX	891,000	XX	934,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value" data.

TABLE 2
OHIO: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit Value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	705	$3,040	$4.31
Filter stone	22	91	4.14
Other coarse aggregate 3/	530	2,540	4.79
Coarse aggregate, graded:			
Concrete aggregate, coarse	3,650	13,000	3.56
Bituminous aggregate, coarse	2,380	8,760	3.68
Bituminous surface-treatment aggregate	354	2,380	6.71
Railroad ballast	2,780	11,400	4.12
Other graded coarse aggregate	809	3,380	4.18
Fine aggregate (-3/8 inch):			
Stone sand, concrete	453	1,600	3.52
Stone sand, bituminous mix or seal	3,390	13,800	4.06
Screening, undesignated	1,860	5,660	3.04
Other fine aggregate	719	3,260	4.53
Coarse and fine aggregates:			
Graded road base or subbase	904	33,000	36.54
Unpaved road surfacing	4,160	18,800	4.52
Crusher run or fill or waste	817	3,750	4.59
Other coarse and fine aggregates	106	485	4.58
Other construction materials 4/	173	833	4.82
Agricultural: Agricultural limestone 5/	925	5,130	5.55
Chemical and metallurgical:			
Cement manufacture	1,360	4,960	3.64
Lime manufacture	W	W	4.13
Flux stone	828	6,410	7.74
Sulfur oxide removal	W	W	11.17
Special:			
Asphalt fillers or extenders	W	W	10.43
Other fillers or extenders	W	W	8.69
Other specified uses not listed	515	3,430	6.66
Unspecified: 6/			
Actual	20,600	97,600	4.73
Estimated	4,710	21,400	4.54
Total	60,900	265,000	4.35

W Withheld to avoid disclosing company proprietary data; included with "Other specified uses not listed."

1/ Includes dolomite, limestone, limestone-dolomite, and sandstone.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes macadam.

4/ Includes building products and roofing granules.

5/ Includes poultry grit and mineral food.

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
OHIO: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	83	41,700	$190,000	$4.56	83	46,000	$206,000	$4.47
Dolomite	21	14,500	59,900	4.15	20	14,900	58,800	3.95
Sandstone	5	232	832	3.59	3	74	419	5.66
Total	XX	56,400	251,000	4.45	XX	60,900	265,000	4.35

XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes "limestone-dolomite," reported with no distinction between the two.

TABLE 4
OHIO: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:										
Coarse aggregate (+1 1/2 inch) 3/	353	1,290	W	W	W	W	23	116	366	2,190
Coarse aggregate, graded 4/	4,070	14,000	W	W	W	W	W	W	W	W
Fine aggregate (-3/8 inch) 5/	2,170	6,710	W	W	W	W	W	W	W	W
Coarse and fine aggregate 6/	7,510	25,500	W	W	1,950	9,480	W	W	2,980	15,700
Other construction materials 7/	149	703	5,870	21,300	1,530	6,670	3,820	16,500	1,150	5,720
Agricultural 8/	386	1,880	(9/)	(9/)	(9/)	(9/)	101	603	215	1,200
Chemical and metallurgical 10/	(9/)	(9/)	(9/)	(9/)	(9/)	(9/)	--	--	--	--
Special 11/	(9/)	(9/)	--	--	(9/)	(9/)	--	--	--	--
Unspecified: 12/										
Actual	5,830	26,000	1,500	6,230	3,530	17,600	6,590	33,800	3,180	13,900
Estimated	2,900	12,300	562	2,840	951	4,350	148	622	151	1,260
Total	25,100	98,400	8,190	31,900	8,850	42,800	10,700	51,600	8,050	40,000

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Production reported in District 5 was included with "District 6" to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), and screening (undesignated).

6/ Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregate.

7/ Includes building products and roofing granules.

8/ Includes agricultural limestone and poultry grit and mineral food.

9/ Withheld to avoid disclosing company proprietary data; included in "Total."

10/ Includes cement manufacture, flux stone, lime manufacture, and sulfur oxide removal.

11/ Includes asphalt fillers or extenders, other fillers or extenders, and other specified uses not listed.

12/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
OHIO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	8,410	$36,100	$4.30
Plaster and gunite sands	171	660	3.86
Concrete products (blocks, bricks, pipe, decorative, etc.)	1,210	5,430	4.50
Asphaltic concrete aggregates and other bituminous mixtures	4,560	19,000	4.16
Road base and coverings 2/	3,200	14,700	4.61
Fill	4,630	17,800	3.84
Snow and ice control	181	589	3.25
Filtration	125	711	5.69
Other 3/	168	833	4.96
Unspecified: 4/			
Actual	17,000	76,400	4.49
Estimated	5,620	23,700	4.22
Total or average	45,300	196,000	4.33

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement and lime).

3/ Includes roofing granules.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
OHIO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	305	1,080	3,420	14,600	3,260	14,000	1,150	5,140	806	3,000	851	4,350
Asphaltic concrete aggregates and road base materials 3/	82	277	4,280	18,600	3,350	11,500	1,810	9,010	1,770	6,880	1,290	5,770
Other miscellaneous uses 4/	--	--	128	712	102	503	16	70	44	238	3	21
Unspecified: 5/												
Actual	309	1,360	2,080	10,900	10,800	46,100	1,900	9,250	985	5,710	903	3,100
Estimated	385	1,220	1,540	7,920	1,420	5,650	599	2,480	1,150	4,190	527	2,240
Total	1,080	3,940	11,400	52,800	19,000	77,800	5,470	25,900	4,750	20,000	3,570	15,500

1/ Data are rounded to three significant digits; may not add to totals shown.

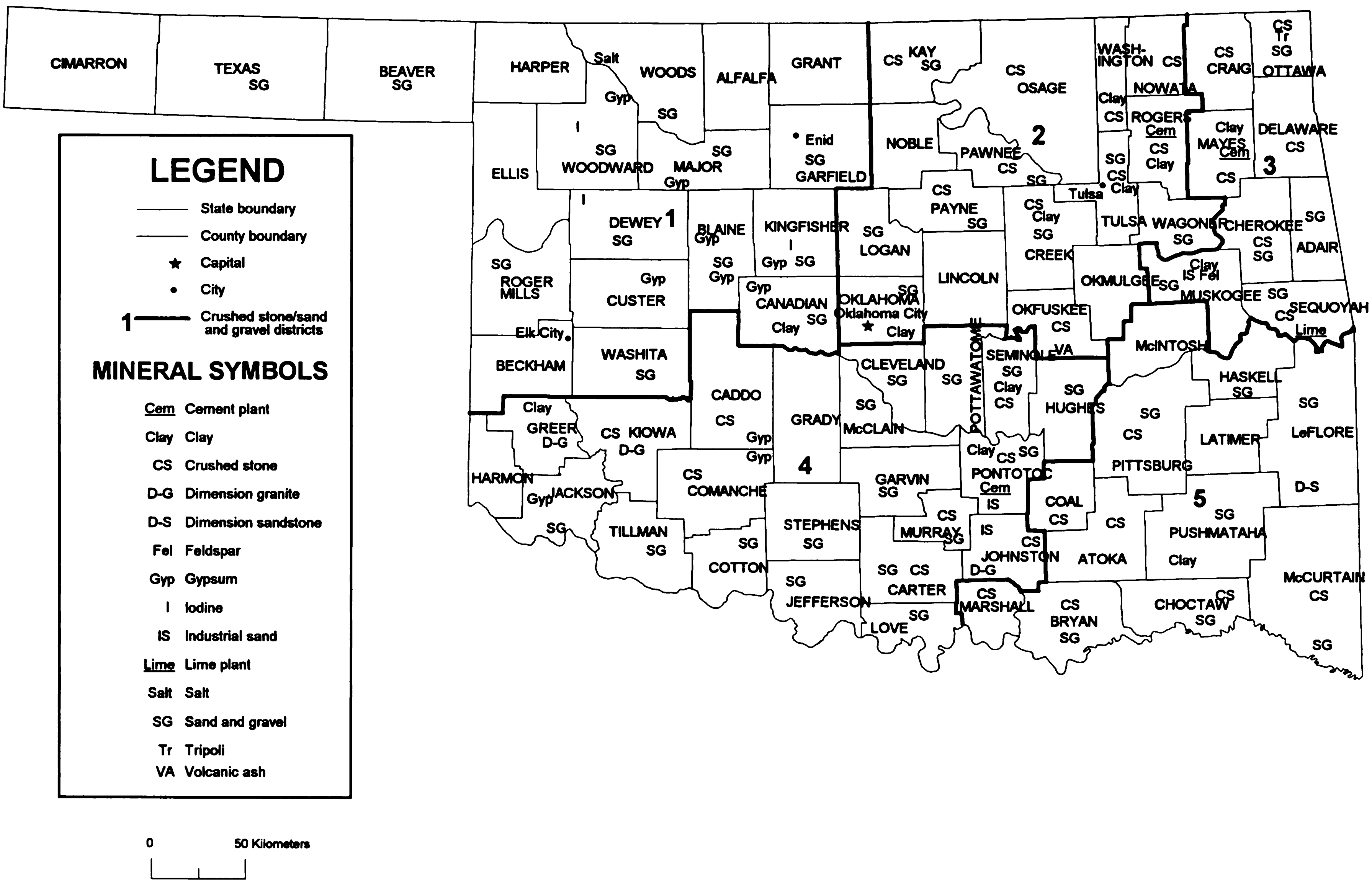
2/ Includes plaster and gunite sands.

3/ Includes fill, road and other stabilization (cement and lime), and snow and ice control.

4/ Includes filtration and roofing granules.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

OKLAHOMA



LEGEND

- State boundary
- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS

Cem	Cement plant
Clay	Clay
CS	Crushed stone
D-G	Dimension granite
D-S	Dimension sandstone
Fel	Feldspar
Gyp	Gypsum
I	Iodine
IS	Industrial sand
Lime	Lime plant
Salt	Salt
SG	Sand and gravel
Tr	Tripoli
VA	Volcanic ash

Source: Oklahoma Geological Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF OKLAHOMA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Oklahoma Geological Survey for collecting information on all nonfuel minerals.

Oklahoma remained 34th in the Nation in total nonfuel mineral production value[1] in 1996, according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $372 million, a 4% increase from that of 1995. This increase followed a 4.9% increase from 1994 to 1995 (based on final 1995 data). The State accounted for 1% of the U.S. total nonfuel mineral production value.

In 1996, crushed stone continued as Oklahoma's leading nonfuel mineral commodity, accounting for about 34% of the State's total nonfuel mineral value. The combined values of construction materials–crushed stone, portland and masonry cements, construction sand and gravel, and gypsum–accounted for 79% of the total value. The increase in mineral value in 1996 mostly resulted from increases in portland cement, iodine, fire clays, and construction sand and gravel. Compared with 1995, all nonfuel minerals increased in value in 1996 except for salt, dimension stone, feldspar, and gemstones, all of which had relatively small decreases. In 1995, increases in portland cement and crushed stone (when crushed shell and traprock are included - see table 1) accounted for most of the year's increase in value.

Oklahoma's mines exclusively produced industrial minerals; no metals were mined in the State. Based on USGS estimates of the quantities produced in the 50 States during 1996, Oklahoma remained first in iodine and crude gypsum; second of 4 States to produce tripoli; third of 3 crude helium-producing States; fourth in feldspar; and ninth in industrial sand and gravel. The State was third in the production of fire clay after having no reported production in 1995. In addition, significant quantities of crushed stone, portland and masonry cements, and common clays were produced in the State.

The following narrative information was provided by the Oklahoma Geological Survey[2] OGC. The OGC reported that industrial mineral activity in the State continued to increase during 1996. Over the past several years, some of the overall trends are those of increasing production of (1) gypsum for wallboard and plasters, (2) crushed stone for aggregate, railroad ballast, and fill, (3) dimension stone for houses and commercial buildings, and (4) sand and gravel for a variety of construction projects. Construction activities that held steady or increased somewhat during 1996 were highway construction (mainly in the northeast and northwest), commercial and apartment building (in metropolitan areas), and airport/airbase runway projects.

Although the production of most minerals continued to increase, there were no major new operations, expansions, or technological gains during 1996. However, Global Stone Corp., an international mining company, acquired St. Clair Lime Co. The acquisition, initiated in July 1995, was finalized the following December. In 1996 Global Stone changed the name of the lime company to Global Stone St. Clair, Inc., which now operates both the underground mine in high-purity limestone near Marble City and the kiln facility in Sallisaw. Another example of industry activity was a significant increase in the number of permits for small companies to produce dimension stone in eastern Oklahoma. The thin-bedded, well-indurated sandstones are prized as a building material for homes and commercial structures.

The number of mining permits in Oklahoma has risen over the past few years. In 1996, the Oklahoma Department of Mines (ODM) issued a total of 482 mining permits covering a total of 15,753 hectares. ODM reported that the State's 1994 law on Life Expectancy Permits was well received. Under that law, a company may submit a mining plan only once to cover the mine's life expectancy, rather than undergoing a permit review every 5 years. Of the permits now on file, ODM reported that 127 have been secured under the Life Expectancy provision.

Oklahoma is the only State that produces iodine, an important trace element for human development. Iodine production continued to be an important activity in Oklahoma, all domestic production coming from three companies operating in the northwest part of the State. Oklahoma's iodine production value rose in 1996, spurred on largely by the price increase from about $11 per kilogram to about $15 per kilogram over the span of 12 months. North American Brine Resources reopened its iodine-producing facility in the Woodward area in the summer of 1996. The three iodine producers in Oklahoma, IOCHEM Corp., North American Brine Chemicals, and Woodward Iodine Corp., supplied approximately 34% of the U.S. domestic demand, the remainder being imported.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (e.g., construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Kenneth S. Johnson, Associate Director of the Oklahoma Geological Survey, authored the text of State minerals information submitted by the agency.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN OKLAHOMA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	91	7,410	95	7,250	100	7,630
Portland	1,680	102,000	1,740	110,000	1,820	115,000
Clays	771	3,910	674	3,580	814	6,710
Gypsum (crude)	2,890	17,000	2,830	17,000	2,890	17,900
Iodine (crude) metric tons	1,630	12,800	1,210	12,500	1,170	15,800
Sand and gravel:						
Construction	8,480	27,200	7,800	25,100	8,330	27,500
Industrial	1,230	24,000	1,250	25,400	1,250	25,400
Stone:						
Crushed	29,900	125,000	31,100	125,000	29,600	126,000
Dimension metric tons	3,980 3/	1,250 3/	9,170 3/	2,350 3/	14,000	2,220
Combined value of feldspar, gemstones, helium [crude (1995-96)], lime, salt, stone [crushed shell and traprock (1995-96), dimension quartzite and sandstone (1995), dimension sandstone (1994)], and tripoli	XX	19,400	XX	28,700	XX	28,700
Total	XX	340,000	XX	357,000	XX	372,000

p/ Preliminary. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain stones; kind and value included with "Combined value" figure.

TABLE 2
OKLAHOMA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	552	$3,280	$5.94
Filter stone	399	1,840	4.61
Other coarse aggregate	5	41	8.20
Coarse aggregate, graded:			
Concrete aggregate, coarse	2,610	12,300	4.71
Bituminous aggregate, coarse	1,250	5,820	4.64
Bituminous surface-treatment aggregate	554	2,830	5.11
Railroad ballast	W	W	3.34
Other graded coarse aggregate	W	W	5.47
Fine aggregate (-3/8 inch):			
Stone sand, concrete	W	W	3.54
Stone sand, bituminous mix or seal	W	W	2.68
Screening, undesignated	4,970	20,900	4.21
Other fine aggregate	W	W	5.46
Coarse and fine aggregates:			
Graded road base or subbase	1,830	6,640	3.62
Unpaved road surfacing	178	651	3.66
Crusher run or fill or waste	5,020	15,700	3.13
Other coarse and fine aggregates	347	1,390	4.79
Other construction materials 3/	2,460	8,910	3.63
Agricultural:			
Agricultural limestone	169	590	3.49
Poultry grit and mineral food	(4/)	(4/)	9.38
Other agricultural uses	(4/)	(4/)	3.69
Chemical and metallurgical:			
Cement manufacture	2,450	6,850	2.79
Flux stone	306	1,380	4.51
Special: Mine dusting or acid water treatment	(4/)	(4/)	8.63
Unspecified: 5/			
Actual	4,450	20,200	4.54
Estimated	3,410	14,600	4.28
Total	31,100	125,000	4.02

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Includes dolomite, granite, limestone, miscellaneous stone, sandstone, and slate; excludes shell and traprock, value only, from State total to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes lightweight aggregate (slate) and roofing granules.

4/ Withheld to avoid disclosing company proprietary data; included in "Total."

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
OKLAHOMA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994 Number of quarries	1994 Quantity (thousand metric tons)	1994 Value (thousands)	1994 Unit value	1995 Number of quarries	1995 Quantity (thousand metric tons)	1995 Value (thousands)	1995 Unit value
Limestone	43 r/	21,700 r/	$87,400 r/	$4.03 r/	47	21,800	$88,800	$4.07
Dolomite	4 r/	2,680 r/	11,400 r/	4.24 r/	4	3,740	15,700	4.20
Granite	2	W	W	5.29	3	W	W	5.21
Traprock	1	W	W	4.18	1	1,490	(2/)	(2/)
Sandstone	5	2,170	10,400	4.81	5	W	W	4.93
Shell	--	--	--	--	(2/)	(2/)	(2/)	(2/)
Slate	1	W	W	1.08	1	12	66	5.50
Miscellaneous stone	1	23	99	4.30	1	27	118	4.37
Total	XX	29,900	125,000	4.18	XX	31,100	125,000	4.02

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Excludes shell and traprock, value only, from State total to avoid disclosing company proprietary data.

TABLE 4
OKLAHOMA: CRUSHED STONE 1/ 2/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 3/

(Thousand metric tons and thousand dollars)

Use	District 2 Quantity	District 2 Value	District 3 Quantity	District 3 Value	District 4 Quantity	District 4 Value	District 5 Quantity	District 5 Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 4/	222	1,400	347	W	318	W	70	446
Coarse aggregate, graded 5/	1,550	8,870	W	W	W	W	W	W
Fine aggregate (-3/8 inch) 6/	886	2,310	W	W	W	W	755	3,240
Coarse and fine aggregate 7/	1,230	4,760	399	1,570	W	W	W	W
Other construction materials 8/	--	--	590	3,760	9,910	36,100	3,910	17,900
Agricultural 9/	(10/)	(10/)	111	(10/)	--	--	(10/)	(10/)
Chemical and metallurgical 11/	(10/)	(10/)	(10/)	(10/)	(10/)	(10/)	(10/)	(10/)
Special	--	--	(10/)	(10/)	--	--	--	--
Unspecified: 12/								
Actual	2,690	12,700	(10/)	(10/)	(10/)	(10/)	--	--
Estimated	104	149	148	620	1,470	6,020	1,690	7,810
Total	7,690	32,300	2,670	9,880	13,900	51,600	6,820	31,100

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ No crushed stone was produced in District 1.

2/ Excludes shell and traprock, value only, from State total to avoid disclosing company proprietary data.

3/ Data are rounded to three significant digits; may not add to totals shown.

4/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

5/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

6/ Includes stone sand (concrete), stone sand (bituminous mix or seal), and screening (undesignated), and other fine aggregate.

7/ Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

8/ Includes lightweight aggregate (slate) and roofing granules.

9/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

10/ Withheld to avoid disclosing company proprietary data; included in "Total."

11/ Includes cement manufacture and flux stone.

12/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
OKLAHOMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	4,180	$14,300	$3.43
Plaster and gunite sands	79	230	2.91
Concrete products (blocks, bricks, pipe, decorative, etc.)	50	184	3.68
Asphaltic concrete aggregates and other bituminous mixtures	316	779	2.47
Road base and coverings	308	848	2.75
Fill	1,270	2,120	1.67
Snow and ice control	16	50	3.13
Other	38	245	6.45
Unspecified: 2/			
Actual	631	2,960	4.68
Estimated	909	3,370	3.71
Total or average	7,800	25,100	3.22

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
OKLAHOMA: CONSTRUCTION SAND AND GRAVEL 1/ SOLD OR USED IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 3/	789	3,250	1,810	5,420	1,710	6,070
Asphaltic concrete aggregates and road base materials 4/	360	803	939	1,850	613	1,150
Other miscellaneous uses	3	39	--	--	35	206
Unspecified: 5/						
Actual	--	--	--	--	631	2,960
Estimated	117	599	541	1,630	251	1,140
Total	1,270	4,690	3,290	8,900	3,240	11,500

1/ Production reported in District 3 and 5 was included with "District 4" to avoid disclosing company proprietary data.

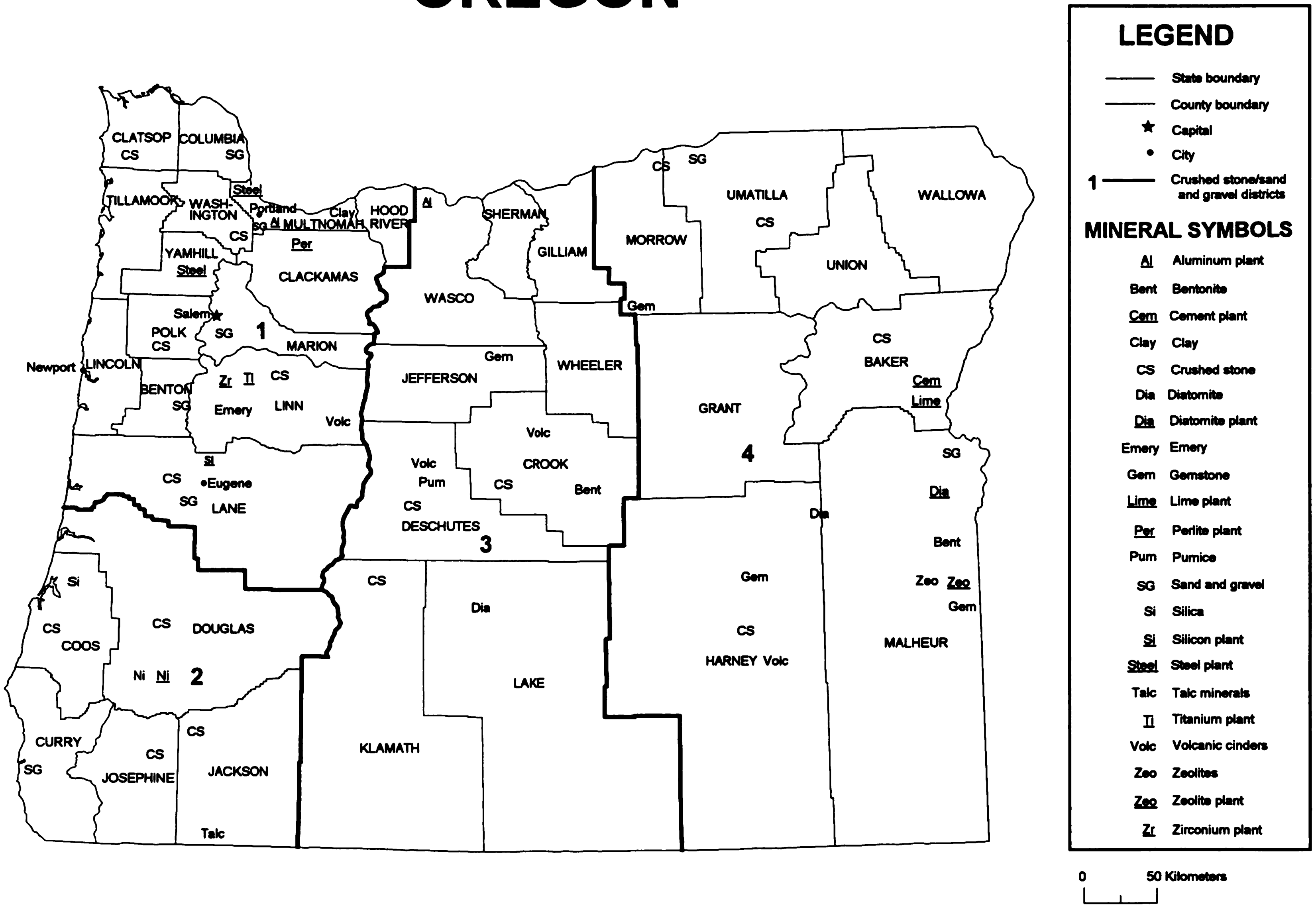
2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes plaster and gunite sands.

4/ Includes fill and snow and ice control.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

OREGON



Source: Oregon Department of Geology and Mineral Industries/U.S. Geological Survey

THE MINERAL INDUSTRY OF OREGON

In 1996, Oregon moved up one place in rank from 38th to 37th among the 50 States in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was about $251 million, an almost 5% increase compared with that of 1995. This followed a 1.5% decrease from 1994 to 1995 (based on final 1995 data). The State accounted for a little less than 1% of the U.S. total nonfuel mineral production value.

Industrial minerals accounted for all of Oregon's raw nonfuel mineral production value. Crushed stone and construction sand and gravel, by value, are Oregon's two leading nonfuel mineral commodities, accounting for nearly 77% of the State's total nonfuel mineral production value. The combined value increases of these two commodities represented nearly all of Oregon's total net increase in nonfuel mineral production in 1996. Compared with 1995, other nonfuel mineral values that increased in 1996 were those of portland cement, diatomite, pumice and pumicite, and bentonite clays. Decreases occurred in lime (down slightly), gemstones, common clays, emery, and nickel ore.

Based on USGS estimates of the quantities produced in the 50 States during 1996, Oregon remained first in the production of pumice and pumicite, and it continued as the Nation's only State to produce emery. Oregon dropped in rank from third to fourth in diatomite and from fourth to fifth in gemstones (by value). Additionally, significant quantities of crushed stone and construction sand and gravel were produced in the State.

Glenbrook's Nickel Mountain Mine, was on a care and maintenance basis in 1996. The Glenbrook Nickel Co. is a joint venture of Cominco American Inc. and Cominco Resources International Ltd. Nickel Mountain has been the sole domestic producer of primary nickel in the United States in recent years, operating on an intermittent basis—mine production depending on the price of nickel. The mine did not produce in 1996 owing to a decrease in nickel prices. According to the company, the mine was shut down in the latter half of 1993 because of market disruptions and low nickel prices caused, in part, by a surge in nickel exports from Russia. With better prices during 1995, mining resumed but ceased again by the end of the year. In 1996, the company's Riddle nickel smelter used only lateritic ore imported from New Caledonia to produce ferronickel containing 48% to 52% nickel. The ore was supplied by Société Minière du Sud Pacifique and has a higher nickel content than the ore from Nickel Mountain. In 1995, Glenbrook restarted its ferrosilicon furnace. The ferrosilicon is used to make the ferronickel and had been brought on the open market until domestic ferrosilicon prices strengthened. Production of other metals, especially primary aluminum and raw steel, resulted from the processing of materials acquired from other domestic and foreign sources. Oregon remained 13th in the Nation in the production of primary aluminum.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN OREGON 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1994		1995		1996 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
Clays		240	1,560	240	1,270	174	1,980
Copper 3/		(4/)	260	--	--	--	--
Gemstones		NA	2,160	NA	4,570	NA	3,860
Nickel ore	metric tons	--	--	1,560	W	-- 5/	--
Pumice and pumicite	do.	220,000	2,760	W	W	W	W
Sand and gravel (construction)		18,400	83,600	18,200	85,000	19,100	90,700
Silver 3/	metric tons	(4/)	10	--	--	--	--
Stone (crushed)		18,900	90,100	20,700	95,700	21,600	102,000
Zinc 3/	metric tons	118	128	--	--	--	--
Combine value of cement (portland), diatomite, emery, gold (1994), lime, talc and pyrophyllite, and values indicated by symbol W		XX	62,100	XX	52,500	XX	52,800
Total		XX	243,000	XX	239,000	XX	251,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data.

XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Recoverable content of ores, etc.

4/ Less than 1/2 unit.

5/ The mine on Nickel Mountain was on care and maintenance basis in 1996.

TABLE 2
OREGON: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	88	$254	$2.89
Riprap and jetty stone	184	618	3.36
Filter stone	62	329	5.31
Other coarse aggregate	64	200	3.13
Coarse aggregate, graded:			
Concrete aggregate, coarse	162	853	5.27
Bituminous aggregate, coarse	747	3,230	4.32
Bituminous surface-treatment aggregate	263	1,630	6.20
Railroad ballast	85	500	5.88
Other graded coarse aggregate	W	W	1.12
Fine aggregate (-3/8 inch):			
Stone sand, concrete	W	W	8.54
Stone sand, bituminous mix or seal	227	1,570	6.93
Screening, undesignated	24	95	3.96
Coarse and fine aggregates:			
Graded road base or subbase	6,400	31,500	4.92
Unpaved road surfacing	1,510	6,400	4.24
Crusher run or fill or waste	815	3,190	3.91
Other coarse and fine aggregates	W	W	3.79
Other construction materials	977	3,730	3.81
Chemical and metallurgical: Cement manufacture	(3/)	(3/)	3.00
Other miscellaneous uses: Sugar refining	(3/)	(3/)	10.84
Unspecified: 4/			
Actual	4,610	21,100	4.58
Estimated	3,460	15,600	4.51
Total	20,700	95,700	4.63

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Includes granite, limestone, miscellaneous stone, sandstone and quartzite, shell, slate, traprock, and volcanic cinder and scoria.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
OREGON: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994 Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	1995 Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	1	W	W	$4.02	1	W	W	$4.96
Granite	27	54	$235	4.35	27	47	$234	4.98
Traprock	296 r/	15,000 r/	71,400 r/	4.75 r/	284	18,300	84,500	4.63
Sandstone and quartzite	53 r/	313 r/	1,260 r/	4.01 r/	67	380	1,960	5.15
Slate	1	W	W	6.00	1	W	W	6.04
Volcanic cinder and scoria	50 r/	52 r/	325 r/	6.25 r/	51	35	221	6.31
Shell	1	32	103	3.22	1	W	W	3.67
Miscellaneous stone	35 r/	2,490 r/	12,900 r/	5.19	34	889	3,440	3.87
Total	XX	18,900	90,100	4.76	XX	20,700	95,700	4.63

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 4
OREGON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1 Quantity	Value	District 2 Quantity	Value	District 3 Quantity	Value	District 4 Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 2/	312	1,080	74	273	5	14	7	39
Coarse aggregate, graded 3/	800	3,940	W	W	W	W	233	643
Fine aggregate (-3/8 inch) 4/	231	1,660	W	W	--	--	W	W
Coarse and fine aggregate 5/	5,640	27,500	1,780	7,090	W	W	W	W
Other construction materials	332	2,040	283	335	944	4,950	959 6/	4,530 6/
Chemical and metallurgical 7/	--	--	--	--	--	--	(8/)	(8/)
Other miscellaneous uses 9/	--	--	--	--	--	--	(8/)	(8/)
Unspecified: 10/								
Actual	3,520	17,200	--	--	--	--	1,090 6/	3,930 6/
Estimated	2,480	11,600	559	2,080	430	1,920	--	--
Total	13,300	65,000	2,700	9,780	1,380	6,880	32,800 6/	14,100 6/

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), and screening (undesignated).

5/ Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

6/ Includes unspecified within all districts.

7/ Includes cement manufacture.

8/ Withheld to avoid disclosing company proprietary data; included in "Total."

9/ Includes sugar refining.

10/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
OREGON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	5,100	$24,200	$4.75
Plaster and gunite sands	8	79	9.88
Concrete products (blocks, bricks, pipe, decorative, etc.)	3	15	5.00
Asphaltic concrete aggregates and other bituminous mixtures	1,280	7,060	5.52
Road base and coverings 2/	3,860	19,200	4.99
Fill	898	3,060	3.41
Snow and ice control	60	385	6.42
Other 3/	623	3,030	4.86
Unspecified: 4/			
Actual	1,870	9,130	4.89
Estimated	4,540	18,800	4.14
Total or average	18,200	85,000	4.66

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Includes filtration.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
OREGON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4		Unspecified within all districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates (including concrete sand) 2/	4,080	19,300	578	2,840	91	699	360	1,470	--	--
Concrete (blocks, brick, pipe, decorative, etc.)	--	--	--	--	--	--	--	--	3	15
Asphaltic concrete aggregates and road base materials 3/	3,900	20,000	924	4,520	6	50	304	1,740	--	--
Other miscellaneous uses 4/	1,180	4,860	173	582	93	362	11	88	127	588
Unspecified: 5/										
Actual	1,440	7,130	--	--	--	--	--	--	429	2,000
Estimated	3,730	15,500	755	3,060	--	--	56	250	--	--
Total	14,300	66,800	2,430	11,000	191	1,110	732	3,540	559	2,600

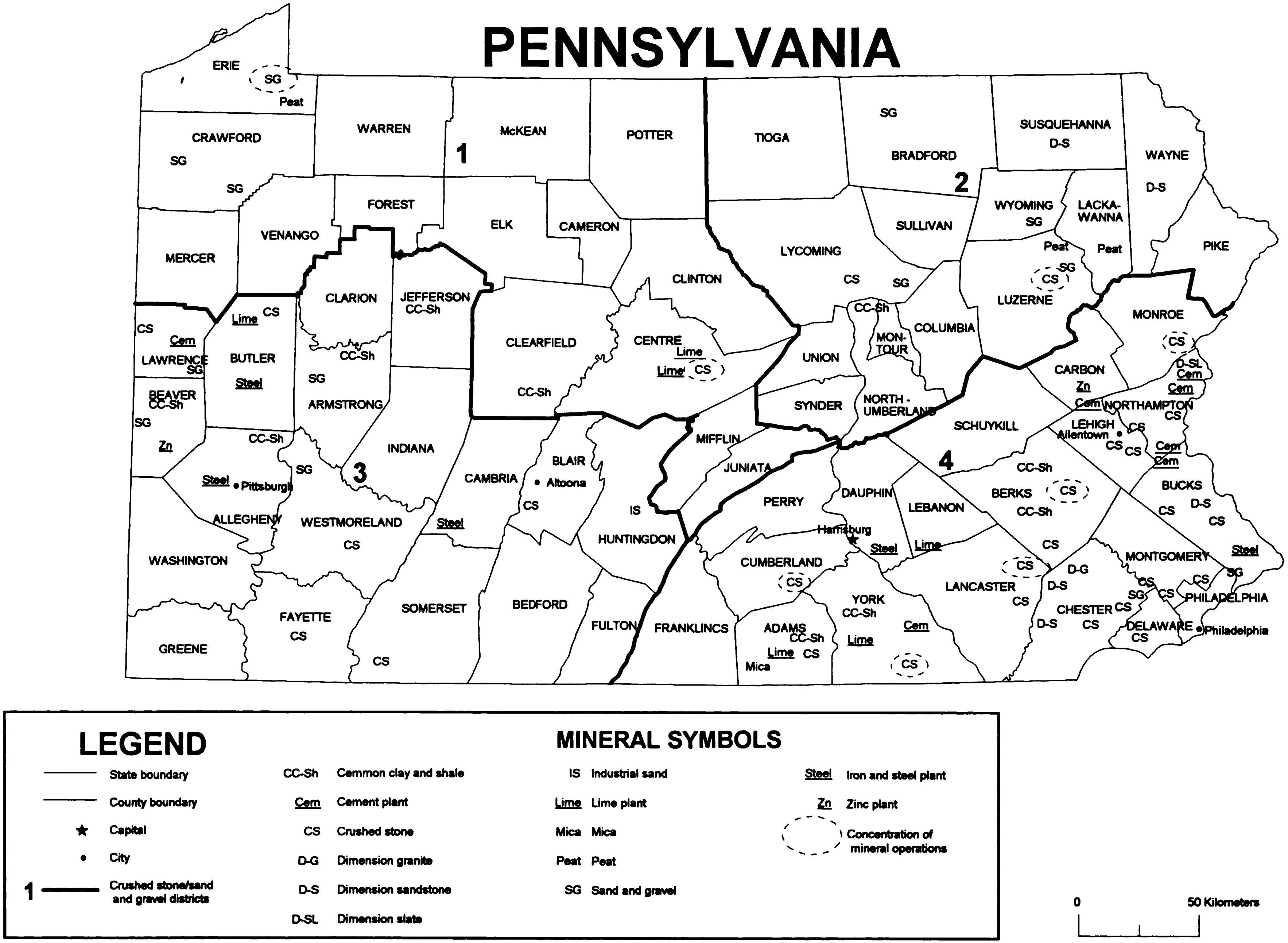
1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization.

4/ Includes filtration and snow and ice control.

PENNSYLVANIA



Source: Pennsylvania Bureau of Topographic and Geologic Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF PENNSYLVANIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Pennsylvania Bureau of Topographic and Geologic Survey for collecting information on all nonfuel minerals.

Pennsylvania ranked 11th among the 50 States in total nonfuel mineral production value[1] in 1996, up from 12th in 1995, according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $1.04 billion, about 4% less than that of 1995. This followed a more than 11% increase from 1993 to 1994 and approximately a 7% increase from 1994 to 1995 (based on revised data for 1993 and 1994 and final 1995 data). The State accounted for almost 3% of the U.S. total nonfuel mineral production value.

Pennsylvania continued to be among the Nation's leading producers of crushed stone, portland cement, lime, and masonry cement (in descending order of value); these four commodities accounted for 91% of the State's total nonfuel mineral production value. In 1996, crushed stone increased in value by $14 million (*see table 1*). But this was more than compensated for a by a $35 million (10%) decrease in the value of portland cement, a $15 million (16%) drop in construction sand and gravel, and an $8 million (8%) decrease in lime. Other nonfuel minerals that decreased included masonry cement, common clays, and peat. A combined increase of $81.5 million in the values of portland cement, crushed stone, and lime led the way to Pennsylvania's significant increase in 1995.

Based on USGS estimates of the quantities produced in the 50 States in 1996, Pennsylvania remained second in crushed stone, fourth of four States that produce tripoli, fifth in lime, and sixth in dimension stone. The State dropped from third to fourth in the production of portland cement and from fifth to sixth in masonry cement. Additionally, significant quantities of construction and industrial sand and gravel and common clays were produced in the State. Pennsylvania is exclusively an industrial mineral- and coal-producing State; metals that were produced in the State, especially steel, were processed from materials received from other domestic or foreign sources. Pennsylvania continued to be the Nation's third leading raw steel-manufacturing State with an estimated output of almost 7.6 million metric tons (8.4 million short tons) of raw steel, as reported by the American Iron and Steel Institute.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN PENNSYLVANIA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	245	19,300	267	21,200	255	20,000
Portland	5,630	315,000	5,610	355,000	5,070	320,000
Clays	811	4,040	750	3,250	679	2,970
Gemstones	NA	1	NA	1	NA	1
Lime	1,590	95,500	1,640	107,000	1,510	98,700
Peat metric tons	10	296	11 3/	294 3/	5 3/	164 3/
Sand and gravel (construction)	15,900	89,700	17,100	93,100	14,900	78,200
Stone:						
Crushed	76,700	462,000	80,900	492,000	81,700	507,000
Dimension metric tons	43,700 4/	7,280 4/	57,600	12,300	61,600	12,300
Combined value of other industrial minerals	XX	13,300	XX	(5)	XX	(5)
Total	XX	1,010,000	XX	1,080,000 6/	XX	1,040,000 6/

p/ Preliminary. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Data series changed to production beginning in 1995; prior years shipment data may not be comparable.

4/ Excludes certain stones; value included with "Combined value" data.

5/ Value excluded to avoid disclosing company proprietary data.

6/ Partial total; excludes values which must be concealed to avoid disclosing company proprietary data.

TABLE 2
PENNSYLVANIA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	650	$4,680	$7.19
Filter stone	226	1,330	5.86
Other coarse aggregate 3/	717	4,490	6.26
Coarse aggregate, graded:			
Concrete aggregate, coarse	5,650	34,200	6.06
Bituminous aggregate, coarse	6,840	38,500	5.63
Bituminous surface-treatment aggregate	2,350	13,700	5.83
Railroad ballast	757	4,420	5.84
Other graded coarse aggregate	3,880	25,300	6.51
Fine aggregate (-3/8 inch):			
Stone sand, concrete	527	3,170	6.01
Stone sand, bituminous mix or seal	2,970	16,900	5.69
Screening, undesignated	1,290	7,280	5.65
Other fine aggregate	332	2,440	7.36
Coarse and fine aggregates:			
Graded road base or subbase	11,900	61,500	5.17
Unpaved road surfacing	1,440	6,690	4.65
Terrazzo and exposed aggregate	147	3,550	24.12
Crusher run or fill or waste	1,460	6,840	4.69
Other coarse and fine aggregates	3,720	24,200	6.50
Other construction materials 4/	2,780	24,800	8.92
Agricultural:			
Agricultural limestone	579	6,620	11.42
Poultry grit and mineral food	67	1,550	23.10
Other agricultural uses	W	W	11.22
Chemical and metallurgical:			
Cement manufacture	6,470	31,800	4.93
Lime manufacture	679	4,560	6.72
Flux stone	27	409	15.15
Sulfur oxide removal	275	3,320	12.07
Special:			
Mine dusting or acid water treatment	W	W	25.43
Asphalt fillers or extenders	503	5,120	10.18
Whiting or whiting substitute	41	1,810	44.07
Other fillers or extenders	71	1,050	14.83
Other specified uses not listed	360	4,700	13.04
Unspecified: 5/			
Actual	12,400	76,700	6.18
Estimated	11,800	70,700	6.01
Total	80,900	492,000	6.09

W Withheld to avoid disclosing company proprietary data; included with "Other specified uses not listed."

1/ Includes dolomite, granite, limestone, limestone-dolomite, marble, miscellaneous stone, sandstone and quartzite, and traprock.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes macadam.

4/ Includes building products and roofing granules.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
PENNSYLVANIA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994				1995			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	111 r/	43,700 r/	$255,000 r/	$5.82 r/	125	46,000	$271,000	$5.90
Dolomite	18	14,900 r/	91,600 r/	6.15 r/	17	16,000	100,000	6.27
Sandstone and quartzite	35 r/	6,880 r/	44,500 r/	6.47 r/	35	5,230	33,200	6.35
Traprock	12 r/	4,000 r/	30,200 r/	7.55 r/	12	5,100	36,800	7.22
Granite	7	2,570	15,800	6.13	7	2,660	19,400	7.30
Marble	1	476	3,210	6.73	1	433	2,840	6.56
Miscellaneous stone	15	4,110 r/	21,800 r/	5.31	17	5,500	28,800	5.23
Total	XX	76,700	462,000	6.02	XX	80,900	492,000	6.09

r/ Revised. XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes "limestone-dolomite, " reported with no distinction between the two.

TABLE 4
PENNSYLVANIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 2/	W	W	W	W	498	3,400	842	5,590
Coarse aggregate, graded 3/	810	3,730	1,140	6,760	4,250	26,900	13,300	78,800
Fine aggregate (-3/8 inch) 4/	W	W	W	W	861	5,220	3,350	19,900
Coarse and fine aggregate 5/	W	W	W	W	3,380	19,800	12,700	71,300
Other construction materials 6/	1,190	4,320	2,660	13,900	1,510	9,820	1,200	14,600
Agricultural 7/	(8/)	(8/)	(8/)	(8/)	47	651	568	7,020
Chemical and metallurgical 9/	(8/)	(8/)	(8/)	(8/)	(8/)	(8/)	758	21,500
Special 10/	--	--	(8/)	(8/)	(8/)	(8/)	552	7,100
Other miscellaneous uses 11/	539	4,160	244	2,990	2,160	14,600	203	2,950
Unspecified: 12/								
Actual	234	1,400	1,120	7,200	2,240	15,500	8,830	52,600
Estimated	1,580	9,750	1,260	6,470	2,100	13,600	6,810	40,800
Total	4,360	23,400	6,420	37,300	17,000	109,000	53,100	322,000

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

5/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

6/ Includes building products and roofing granules.

7/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

8/ Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses."

9/ Includes cement manufacture, flux stone, lime manufacture, and sulfur oxide removal.

10/ Includes asphalt fillers or extenders, mine dusting or acid water treatment, other fillers or extenders, and whiting or whiting substitute.

11/ Includes other specified uses not listed.

12/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
PENNSYLVANIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	4,800	$33,700	$7.03
Plaster and gunite sands	120	1,020	8.53
Concrete products (blocks, bricks, pipe, decorative, etc.)	214	1,560	7.30
Asphaltic concrete aggregates and other bituminous mixtures	1,910	12,600	6.60
Road base and coverings	2,130	11,500	5.41
Fill	2,030	5,540	2.72
Snow and ice control	250	1,440	5.76
Other 2/	528	3,650	6.92
Unspecified: 3/			
Actual	2,530	9,130	3.61
Estimated	2,600	12,900	4.96
Total or average	17,100	93,100	5.44

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes filtration, railroad ballast, and roofing granules.

3/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
PENNSYLVANIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	402	3,960	1,190	8,020	1,420	11,000	1,820	13,300
Asphaltic bituminous mixtures	1,220	2,290	512	3,270	683	4,670	313	2,370
Road base and coverings	60	6,060	162	965	639	3,710	104	774
Fill	106	146	70	330	406	1,620	1,500	3,450
Snow and ice control	296	583	51	396	80	361	13	100
Other miscellaneous uses 3/		1,940	29	293	110	749	91	673
Unspecified: 4/								
Actual	207	443	106	681	836	3,890	1,380	4,110
Estimated	1,460	6,830	607	3,470	330	1,780	111	804
Total	4,540	22,300	2,730	17,400	4,510	27,800	5,320	25,600

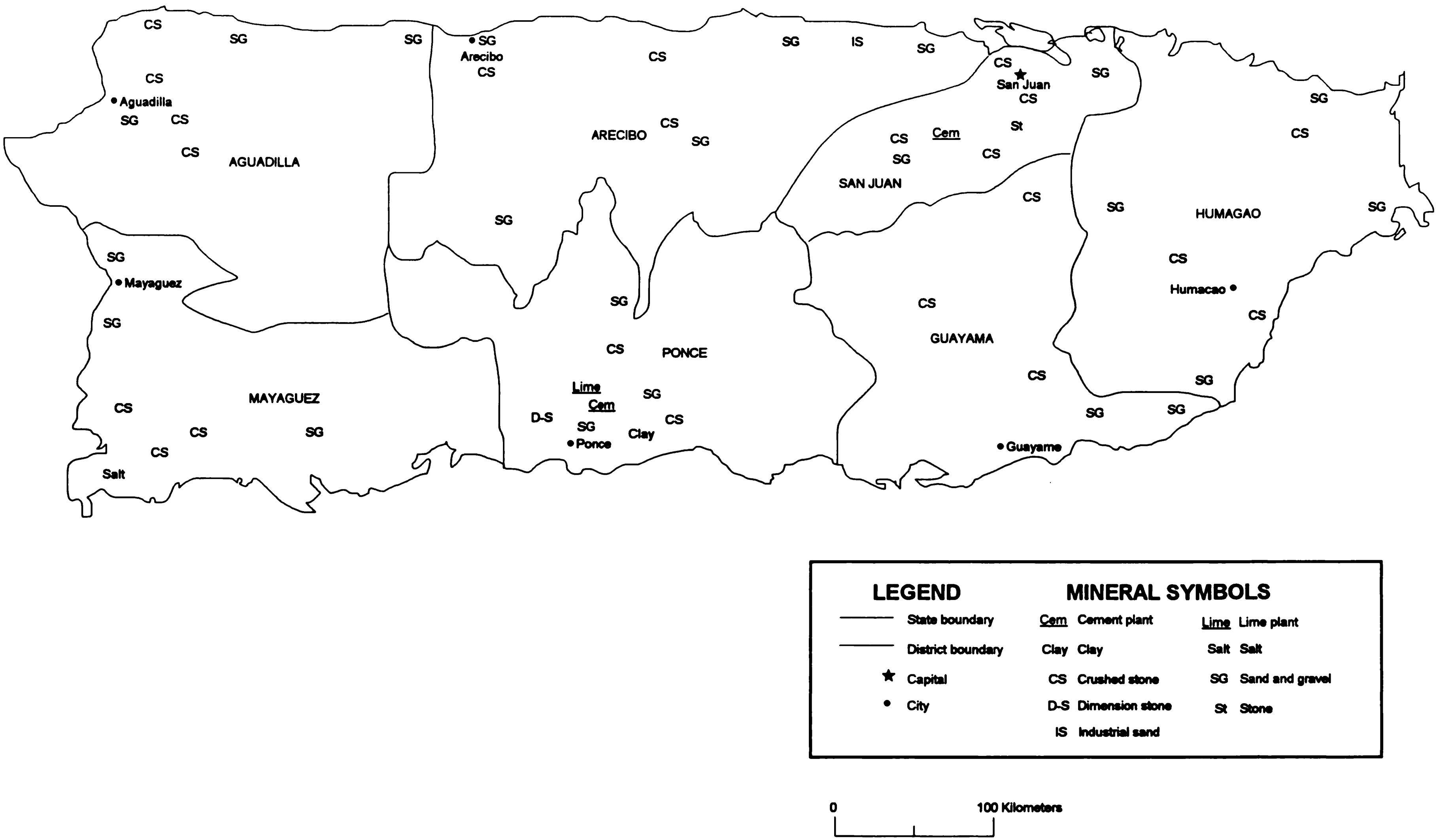
1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes filtration, railroad ballast, and roofing granules.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

PUERTO RICO



Source: Department of Natural Resources, Commonwealth of Puerto Rico/U.S. Geological Survey

THE MINERAL INDUSTRY OF PUERTO RICO AND THE ADMINISTERED ISLANDS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Department of Natural Resources, Commonwealth of Puerto Rico, for collecting information on all nonfuel minerals.

In 1996, the estimated value[1] of nonfuel mineral commodities produced in Puerto Rico was $109 million, according to the U.S. Geological Survey (USGS). Data have been withheld for portland cement, industrial sand and gravel, dimension stone, and common clays (in descending order of value) to protect company proprietary data. Consequently, a comparison of Puerto Rico's total nonfuel mineral values from year to year *(see table 1)* would not be truly representative of changes occurring in the Commonwealth's nonfuel mineral economy. Portland cement and crushed stone by value were the island's leading nonfuel mineral commodities.

If ranked in comparison with the 50 States, Puerto Rico would rank 37th if the four withheld commodities were included in the Commonwealth's total nonfuel mineral value. If based on table 1, it would rank approximately 44th. In 1996, the value of portland cement increased by more than 7% above that of 1995. Nonfuel minerals whose values decreased by small amounts in 1996 included lime and industrial sand and gravel. Crushed stone, common clay, and dimension stone values were estimated to remain virtually the same in 1996 as in 1995. While crushed stone values for American Samoa and Guam remained virtually the same (data withheld for both) from 1995 to 1996, those for the Virgin Islands increased slightly.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. The crushed stone estimate is updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

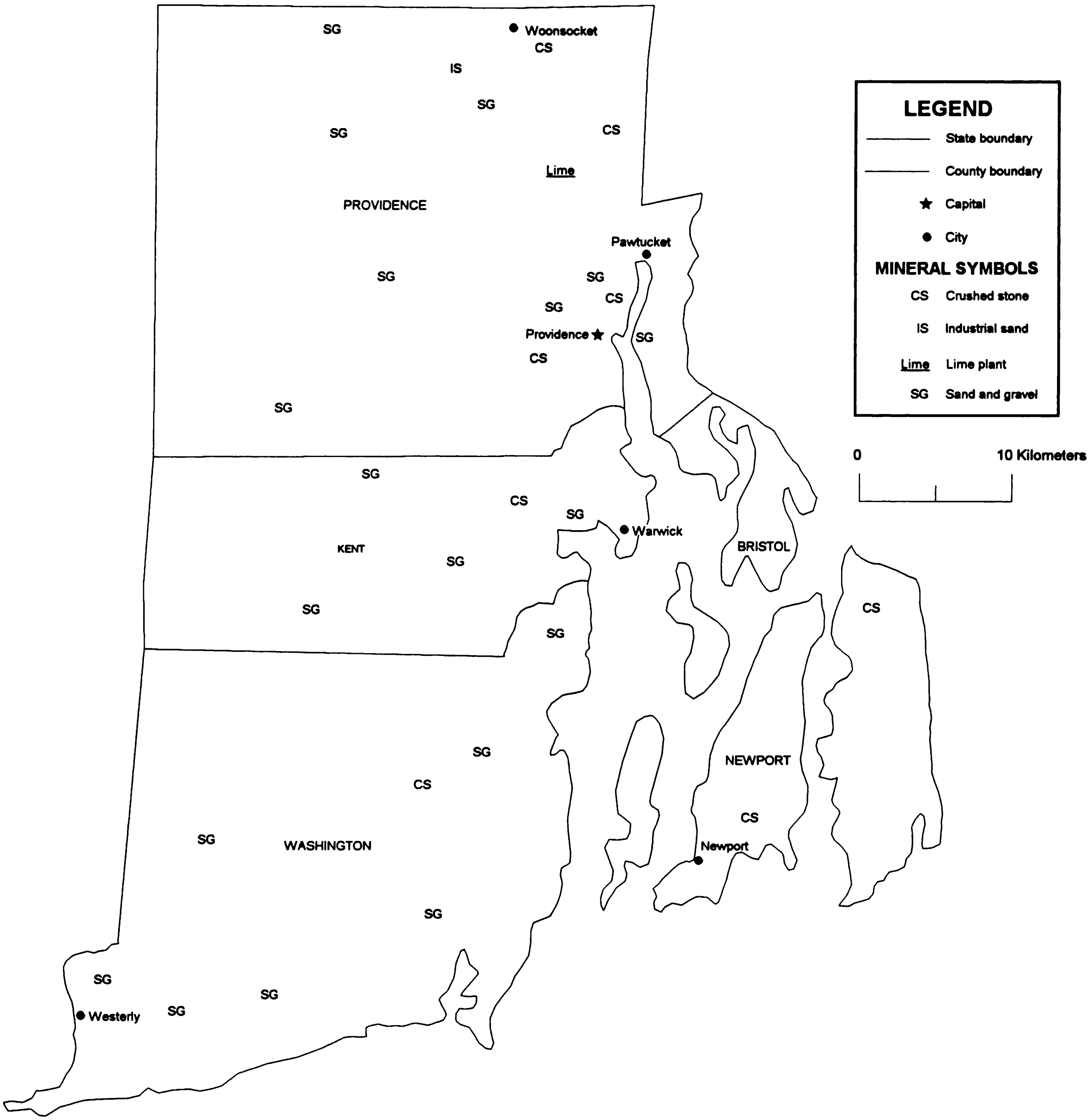
TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN THE COMMONWEALTH OF PUERTO RICO
AND ISLANDS ADMINISTERED BY THE UNITED STATES 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

	1994		1995		1996 p/	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Puerto Rico:						
Cement (portland)	W	W	--	--	1,520	W
Clays	119	338	W	W	W	W
Lime	23	2,970	23	2,970	16	2,090
Stone (crushed)	10,500	78,400	15,300	107,000	15,300	107,000
Total 3/	XX	81,700	XX	110,000	XX	109,000
Administered Islands:						
American Samoa: Stone (crushed)	84	W	W	W	W	W
Guam: Stone (crushed)	2,150	12,700	2,060	17,400	2,100	17,400
Total 3/	XX	12,700	XX	17,400	XX	17,400

p/ Preliminary. W Withheld to avoid disclosing company proprietary data; not included in "Total." XX Not applicable.
1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/ Data are rounded to three significant digits; may not add to totals shown.
3/ Total does not include values of items withheld.

RHODE ISLAND



Source: Rhode Island Department of Environmental Management/U.S. Geological Survey

THE MINERAL INDUSTRY OF RHODE ISLAND

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Rhode Island Department of Environmental Management for collecting information on all nonfuel minerals.

In 1996, Rhode Island ranked 48th among the 50 States in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The State was 49th in 1995. The estimated value for 1996 was nearly $32 million, a 4% increase from that of 1995. This followed a 17% increase from 1994 to 1995 (based on final 1995 data). The State accounted for about one-tenth of 1% of the total U.S. nonfuel mineral production value. The increase in value of construction sand and gravel, the State's leading nonfuel mineral commodity, accounted for most of Rhode Island's gain in nonfuel mineral value in 1995 and 1996. Conversely, crushed stone values decreased during the same time period. Industrial sand and gravel, the value of which increased in 1995 and 1996, was produced in the State, but the data have been withheld from table 1 to avoid disclosing company proprietary data.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. Construction sand and gravel and crushed stone estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN RHODE ISLAND 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones	NA	1	NA	1	NA	1
Sand and gravel (construction)	2,310	14,200	2,790	21,500	3,000	23,900
Stone (crushed)	1,610	12,200	1,250	9,140	1,100	8,000
Total 3/	XX	26,300	XX	30,700	XX	31,900

p/ Preliminary. NA Not available. XX Not applicable.
1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/ Data are rounded to three significant digits; may not add to totals shown.
3/ Partial total, excludes values which must be concealed to avoid disclosing company proprietary data.

TABLE 2
RHODE ISLAND: 1/ CRUSHED STONE 2/ SOLD OR USED BY PRODUCERS
IN 1995, BY USE 3/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction aggregates 4/	375	$2,660	$7.10
Agricultural: Agricultural limestone	(5/)	(5/)	12.71
Other specified uses not listed	(5/)	(5/)	12.71
Unspecified: 6/			
Actual	95	830	8.74
Estimated	773	5,540	7.16
Total	1,250	9,140	7.30

1/ To avoid disclosing company proprietary data; "District tables were not produced for 1995."
2/ Includes granite, limestone, miscellaneous stone, and traprock.
3/ Data are rounded to three significant digits; may not add to totals shown.
4/ Includes bituminous aggregate (coarse), crusher run or fill or waste, filter stone, graded roadbase or subbase, riprap and jetty stone, screening (undesignated), and stone sand (concrete).
5/ Withheld to avoid disclosing company proprietary data; included in "Total."
6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
RHODE ISLAND: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	2	W	W	$8.46	2	W	W	$9.75
Granite	3	568	$3,450	6.07	4	812	$5,380	6.62
Traprock	2	W	W	8.27	2	W	W	8.41
Miscellaneous stone	--	--	--	--	1	76	668	8.79
Total	XX	1,610	12,200	7.58	XX	1,250	9,140	7.30

W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 4
RHODE ISLAND: 1/ CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)		$1,460	$6.44
Plaster and gunite sands	227	46	7.67
Asphaltic concrete aggregates and other bituminous mixtures	6	W	5.09
Road base and coverings	W	860	7.23
Fill	119	324	5.49
Snow and ice control	59	W	10.67
Unspecified: 3/	W		
Actual	249	2,130	8.55
Estimated	2,060	16,300	7.91
Total or average	2,790	21,500	7.71

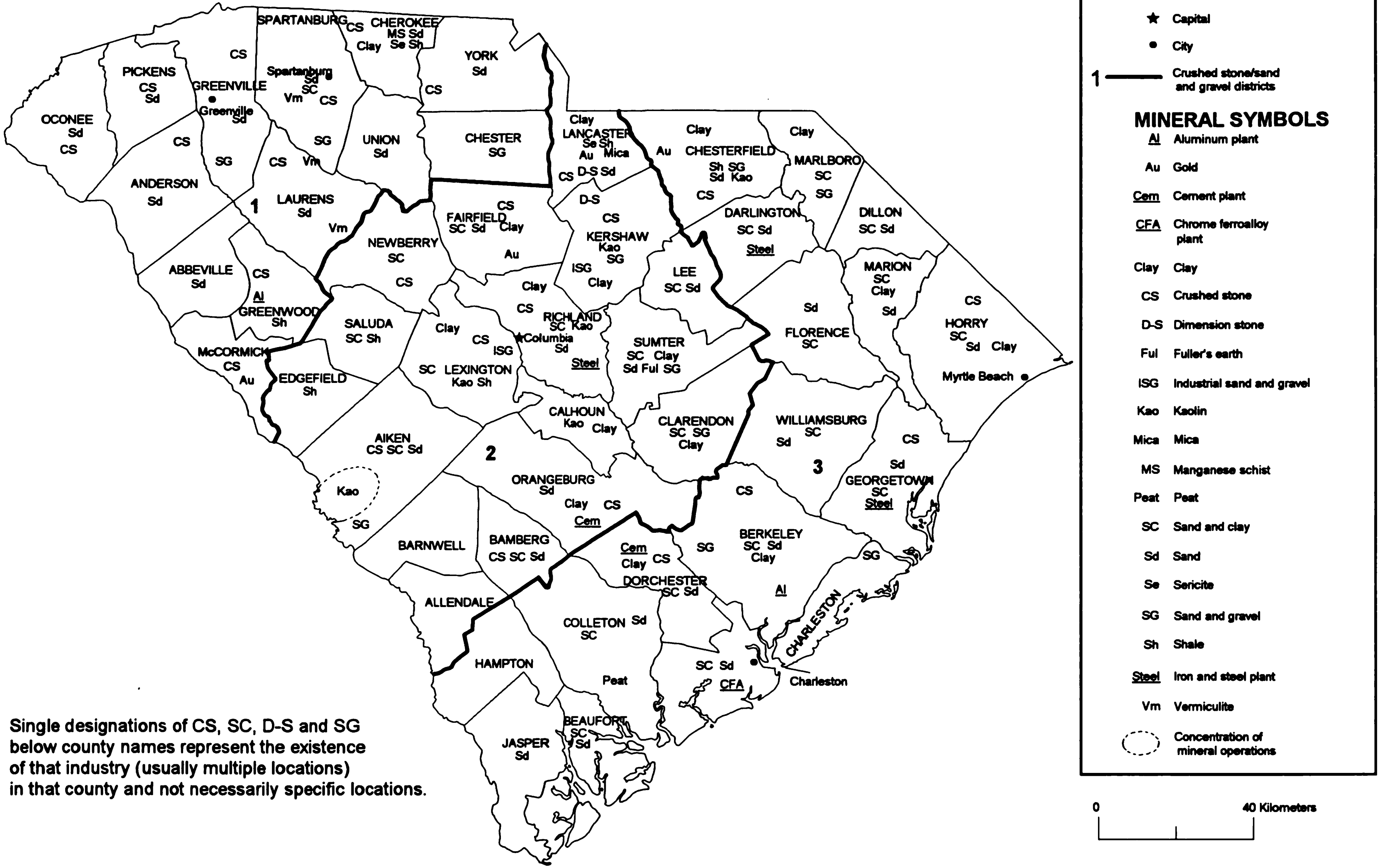
W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ To avoid disclosing company proprietary data; "District tables were not produced in 1995."

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

SOUTH CAROLINA



Single designations of CS, SC, D-S and SG
below county names represent the existence
of that industry (usually multiple locations)
in that county and not necessarily specific locations.

Source: South Carolina Geological Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF SOUTH CAROLINA

This chapter has been prepared under a Memorandum of Understanding between the, U.S. Geological Survey, and the South Carolina Geological Survey for collecting information on all nonfuel minerals.

South Carolina climbed in rank from 30th to 27th in the Nation in total nonfuel mineral production value[1] in 1996, according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $495 million, about a 10.6% increase from that of 1995. This followed a more than 13% increase from 1993 to 1994 and a 1.1% increase from 1994 to 1995 (based on revised final 1994 and final 1995 data). The State accounted for more than 1% of the U.S. total nonfuel mineral production value.

In 1996, nearly all nonfuel minerals increased in value except for kaolin clay and vermiculite, both of which decreased by a small amount. Portland cement led the way with a $16-million increase, followed by crushed stone, up $14 million, and gold and construction sand and gravel, up about $12 million and $4 million, respectively. In 1995, a nearly $9-million decrease in kaolin value and a smaller drop in the value of gold were more than offset by the nonfuel minerals that increased in value. Portland cement increased by nearly $13 million, and smaller yet significant increases occurred in masonry cement and construction and industrial sand and gravel. *(See table 1.)*

Based on USGS estimates of the quantities produced in the 50 States in 1996, South Carolina remained first of two States that produced vermiculite and fourth in crude mica. The State rose from sixth to fifth in the production of masonry cement, from seventh to sixth in common clays, from ninth to seventh in gold; while it dropped from second to third in kaolin. Manganiferous ore was produced in South Carolina alone; however, the ore, a manganiferous schist, was used as a brick colorant and not in the production of manganese metal. Additionally, significant quantities of portland cement, crushed stone, and industrial sand and gravel were produced in the State. Primary aluminum and raw steel also were produced in the State, but from raw materials that were acquired from other domestic and foreign sources. In 1996, South Carolina climbed in rank from 11th to 7th of 14 States in the production of primary aluminum.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN SOUTH CAROLINA 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement (portland)	2,210	143,000	2,210	156,000	2,440	172,000
Clays	1,520 3/	30,400 3/	1,620	21,700 3/	1,690	21,700
Sand and gravel:						
Construction	8,600	26,100	8,880	29,000	9,590	33,100
Industrial	699	18,100	839	20,500	839	20,500
Stone (crushed)	20,500 4/	131,000 4/	22,000	132,000	23,800	146,000
Combined value of cement (masonry), clays [fire (1995), kaolin (1994)], gemstones, gold, manganiferous ore, mica (scrap), peat, silver, stone [crushed marble (1994), dimension granite], and vermiculite	XX	93,900	XX	88,700	XX	102,000
Total	XX	442,000	XX	447,000	XX	495,000

p/ Preliminary. XX Not applicable.
1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/ Data are rounded to three significant digits; may not add to totals shown.
3/ Excludes certain clays; kind and value included with "Combined value" data.
4/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
SOUTH CAROLINA: 1/ CRUSHED STONE 2/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 3/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	W	W	$5.07
Riprap and jetty stone	375	$3,290	8.77
Filter stone	W	W	6.32
Coarse aggregate, graded:			
Concrete aggregate, coarse	2,960	19,900	6.72
Bituminous aggregate, coarse	2,330	16,500	7.07
Railroad ballast	134	913	6.81
Other graded coarse aggregate 4/	320	2,340	7.31
Fine aggregate (-3/8 inch):			
Stone sand, concrete	W	W	2.96
Stone sand, bituminous mix or seal	W	W	5.96
Screening, undesignated	636	4,430	6.96
Coarse and fine aggregates:			
Graded road base or subbase	3,810	21,400	5.61
Crusher run or fill or waste	862	4,430	5.14
Other coarse and fine aggregates	46	319	6.93
Other construction materials	1,160	7,600	6.54
Chemical and metallurgical: Cement manufacture	(5/)	(5/)	2.66
Unspecified: 6/			
Actual	(5/)	(5/)	5.98
Estimated	79	428	5.42
Total	22,000	132,000	5.98

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ To avoid disclosing company proprietary data; "District tables were not produced for 1995."

2/ Includes calcareous marl, granite, limestone, and marble.

3/ Data are rounded to three significant digits; may not add to totals shown.

4/ Includes bituminous surface-treatment aggregate.

5/ Withheld to avoid disclosing company proprietary data; included in "Total."

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
SOUTH CAROLINA: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	7 r/	3,070 r/	$13,000 r/	$4.23 r/	9	3,140	$14,000	$4.44
Calcareous marl	2 r/	W	W	W	2	W	W	W
Granite	21	15,200	97,600	6.43	23	16,600	109,000	6.57
Marble	1	W	W	W	1	W	W	W
Total	XX	20,500 r/	131,000 r/	6.40 r/	XX	22,000	132,000	5.98

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 4
SOUTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand) 2/	4,170	$16,300	$3.90
Concrete products (blocks, bricks, pipe, decorative, etc.)	184	642	3.49
Asphaltic concrete aggregates and other bituminous mixtures	642	1,690	2.63
Road base and coverings 3/	86	190	2.21
Fill	760	1,710	2.25
Snow and ice control	8	51	6.38
Other	929	2,330	2.50
Unspecified: 4/			
Actual	486	1,360	2.80
Estimated	1,620	4,780	2.96
Total or average	8,880	29,000	3.27

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement).

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
SOUTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	227	1,070	1,580	6,000	2,540	9,840
Asphaltic concrete aggregates and road base materials 3/	309	1,170	144	334	1,040	2,140
Other miscellaneous uses	8	114	--	--	921	2,210
Unspecified: 4/						
Actual	--	--	486	1,360	--	--
Estimated	4	15	584	1,490	1,030	3,280
Total	548	2,360	2,800	9,190	5,540	17,500

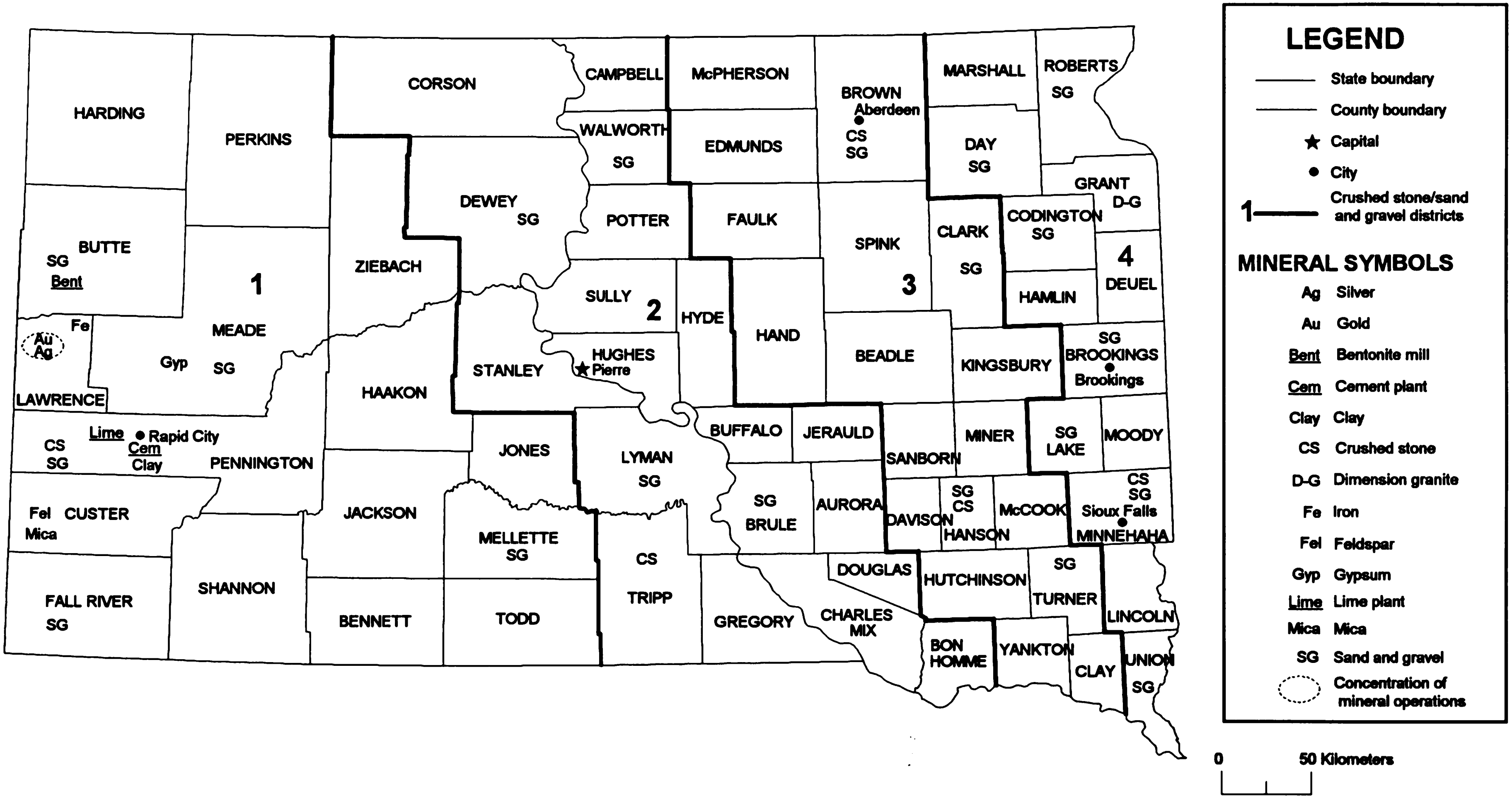
1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes fill, road and other stabilization (cement), and snow and ice control.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

SOUTH DAKOTA



Source: South Dakota Geological Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF SOUTH DAKOTA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey, and the South Dakota Geological Survey for collecting information on all nonfuel minerals.

South Dakota remained 35th in the Nation in total nonfuel mineral production value[1] in 1996, according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $353 million, a more than 6% increase from that of 1995. With this, South Dakota reached a new all time high, previously set at $337 million in 1993. The 1996 increase followed a 3% increase from 1994 to 1995 (based on final 1995 data). The State accounted for almost 1% of the U.S. total nonfuel mineral production value.

Gold remained South Dakota's leading nonfuel mineral by value; the quantity and value have been withheld for 1994 and 1996 to avoid disclosing company proprietary data. In 1996, the values of gold and of the State's second and third leading nonfuel minerals, portland cement and construction sand and gravel, respectively, significantly increased, leading the State to its record year. Only granite dimension stone showed any sizable decrease in 1996 with a drop of about $4 million, following an increase of like magnitude from 1994 to 1995. Changes in value for other nonfuel minerals were small relative to these. Lime, silver, iron ore, and mica values increased in 1996. Values that decreased included those of masonry cement, common clays, and feldspar.

Compared with USGS estimates of the quantities produced in the other 49 States during 1996, South Dakota remained fourth of 14 U.S. gold-producing States, fourth in crude mica production, and rose from eighth to seventh in the production of dimension stone. A small quantity of iron ore was mined in the State mainly for use by a South Dakota cement company as an ingredient in its cement manufacturing process.

The following narrative information was provided by the South Dakota Geological Survey (SDGS)[2] of the State's Department of Environment and Natural Resources (DENR). According to information gathered by the SDGS, the gold mines in the northern Black Hills produced 17.4 metric tons[3] of gold in 1996, which approximately equaled the amount produced in 1995. The average price of gold in 1996 was $387.76 per troy ounce, yielding a gross value of about $217 million. In 1996, SDGS-reported production was as follows: Homestake Mining Co., 12.7 metric tons; Wharf Resources, 3.3 tons; Brohm Mining Corp., 0.7 tons; and Golden Reward Mining Co., 0.7 tons. All mines are surface heap-leach operations with the exception of Homestake.

In January 1996, the State issued a new mine permit for Brohm Mining Corp.'s Anchor Hill Project, which is a fully owned subsidiary of Dakota Mining Corp. The project is estimated to yield about 7.8 million tons of ore and 7.5 tons of gold during a 6-year period. The permit incorporates stringent requirements for characterizing the reactivity of ore and waste rock and for preventing acid mine drainage. Brohm's Anchor Hill Project offers the added benefit of improving upon a previously permitted reclamation plan to mitigate acid mine drainage at the company's adjacent Gilt Edge Mine, which was permitted in 1986 and is now in its closure stage.

In November 1996, Wharf Resources Ltd. submitted a mine permit application for its Clinton Project, which involved 21.6 million tons of ore, 50.3 million tons of waste, and 21.1 tons of proven and probable total gold reserves. The project was scheduled to be presented in front of the State Board of Minerals and Environment in the summer of 1997, and, if permitted, production was projected to continue through 2007. Homestake Mining Co. began construction on the third lift of its Grizzly Gulch tailings dam. The raise is estimated to provide additional storage capacity until 2013. The Golden Reward Mine entered a period of temporary cessation in December 1996 in order to resolve land ownership issues and complete permitting of additional reserves.

In 1996, 435 industrial mineral companies had active mine licenses in South Dakota. An operator must obtain a license in order to mine for sand, gravel, pegmatite minerals, materials used in the process of making cement or lime, or rock to be crushed and used in construction. Sand and gravel was the major nonmetallic industrial mineral commodity produced with 12 million tons reported removed, based on SDGS estimates. Sand and gravel is produced in nearly every county in South Dakota and is used mainly for road construction projects. Sioux Quartzite was the next largest nonmetallic industrial mineral commodity produced with 2.3 million tons reported removed. It is quarried from four locations in southeastern South Dakota, and most of the quartzite is crushed and used in construction. Some larger blocks are used for riprap, railroad ballast, and occasionally for decorative purposes. Pegmatite mining, mainly in the southern Black Hills, produced 8,636 tons of pegmatite minerals such as feldspar, mica, and rose quartz. The South Dakota Cement Plant reported mining 1.8 million tons of limestone, 134,929 tons of shale, and 33,500 tons of gypsum. A total of 143,000 tons of granite was mined by Dakota Granite Co. and Cold Spring Granite Co. from quarries near Milbank, SD. Because of its beauty, Milbank Granite is used primarily by the building industry and for decorative stone purposes. Much of it goes to international markets. Sales from 1996 production totaled $19.5 million.

Exploration

Nine exploration permits were issued in 1996 to the following companies: Wharf Resources, Naneco Minerals Inc., Golden Reward Mining Co., REM Co., and Lew and April Wight. Primary minerals explored were gold and silver. A total of 701 test holes, 2 bulk samples, and 1 exploration drift were permitted for exploration in Lawrence and Pennington Counties. Diamond core drilling methods will be used for holes drilled up to 4,570 meters in depth. Reverse circulation, percussion, and rotary drilling methods will be used for shallow holes. In addition to routine fill-in and step-out drilling at existing mines, a renewed exploratory interest was noted in a geologically complex Precambrian iron formation-hosted gold deposit south of Rochford, SD. This site has undergone extensive exploration by other operators in the past and is currently being explored by Naneco Minerals. Results continue to indicate that the deposit, if mined, will primarily be an underground operation.

Environmental Issues

No notices of violation were issued to mining companies during 1996. Based on 1996 performance monitoring results at LAC Minerals Ltd.'s Richmond Hill Mine, reclamation efforts to mitigate acid mine drainage problems that developed in 1992 were successful. Reactive waste rock (3.2 million tons) was relocated from a valley-fill depository, backfilled in the pit from which it was originally mined, and capped in order to isolate the waste from surface runoff and to prevent soluble contaminants from degrading ground water. Relocation and capping were completed in 1995. The reclaimed pit impoundment was fitted with numerous performance monitoring devices designed to track the long-term success of remedial measures. Results from gravity and barrel lysimeters, heat dissipation units, neutron probes, piezometers, pore gas (oxygen and carbon dioxide) monitoring, temperature probes, water quality and aquatic monitoring, and cap settlement surveys, all have indicated that the reclaimed site is performing better than expected. In June 1996, the DENR approved LAC Minerals Ltd.'s closure plan for its three leach pads. Pad closure activities were largely completed in 1996. They included amending spent ore in one heap with alkaline material and capping all three pads.

Brohm Mining Corp. continued efforts at its Gilt Edge Mine to reclaim acid mine drainage, which included treating and discharging acid water collected from the base of the waste rock depository and that which was stored in the pits. Active treatment by a water treatment plant was the most effective way of treating and discharging acid waters at Brohm in 1996. In 1997, forced air evaporation will be pursued as a significant supplemental, less expensive method of reducing acid water stored in the pits. Backfilling of the Gilt Edge Mine pits with nonreactive material from the Anchor Hill project began in 1996 and will continue.

A significant amount of reclamation took place at the large-scale gold mines in 1996. By the end of the year, 175 hectares of land affected by surface mining were reclaimed. Because of concerns over the cumulative impacts of mining in the Black Hills, a law was passed in 1992 requiring that 202 hectares of land attributable to surface mining for gold be reclaimed by September 1, 1997. If the 202-hectare reclamation requirement is not met by that time, no new permits or amendments to existing permits for surface gold mines can be issued. The DENR projects that the required 202 hectares will have been reclaimed by the September deadline. At that time, the State Board of Minerals and Environment will review the effectiveness of the reclamation standards set forth in South Dakota's mining laws and regulations.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] T.V. Durkin, E.H. Holm, and B.A. Regynski of the South Dakota Department of Environment and Natural Resources' Office of Minerals and Mining jointly authored the text of mineral industry information submitted by the SDGS.

[3] All tons are metric unless otherwise specified.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN SOUTH DAKOTA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1994 Quantity	1994 Value	1995 Quantity	1995 Value	1996 p/ Quantity	1996 p/ Value
Clay (common)		W	W	136	W	106	W
Gemstones		NA	110	NA	173	NA	W
Gold 3/	kilograms	W	W	17,100	214,000	W	W
Sand and gravel (construction)		7,700	23,700	8,730	26,200	9,540	31,000
Silver 3/	metric tons	4	696	4	668	7	1,190
Stone (crushed) 4/		5,490	24,500	5,420	25,700	5,800	28,000
Combined value of cement, clays (common), feldspar, iron ore (usable), lime, mica (scrap), stone [crushed granite and miscellaneous (1995-96), crushed miscellaneous (1994), dimension granite], and values indicated by symbol W		XX	274,000	XX	65,300	XX	293,000
Total		XX	323,000	XX	332,000	XX	353,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Recoverable content of ores, etc.

4/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
SOUTH DAKOTA: 1/ CRUSHED STONE 2/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 3/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone 4/	249	$1,540	$6.20
Coarse aggregate, graded:			
Concrete aggregate, coarse	359	1,870	5.20
Bituminous surface-treatment aggregate	143	852	5.96
Railroad ballast	108	576	5.33
Coarse and fine aggregates:			
Graded road base or subbase	344	1,570	4.57
Other construction materials 5/	398	1,620	4.06
Chemical and metallurgical:			
Cement manufacture	(6/)	(6/)	1.70
Lime manufacture	(6/)	(6/)	4.51
Glass manufacture	(6/)	(6/)	19.46
Unspecified: 7/			
Actual	1,990	12,100	6.10
Estimated	709	3,150	4.45
Total	5,420	25,700	4.74

1/ To avoid disclosing company proprietary data; "District tables were not produced in 1995."

2/ Includes limestone and quartzite; excludes granite and miscellaneous stone from State total to avoid disclosing company proprietary data.

3/ Data are rounded to three significant digits; may not add to totals shown.

4/ Includes filter stone and other coarse aggregate.

5/ Includes bituminous aggregate (coarse), crusher run or fill or waste, stone sand (bituminous mix or seal), and screening (undesignated).

6/ Withheld to avoid disclosing company proprietary data; included in "Total."

7/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
SOUTH DAKOTA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994 2/				1995 3/			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	5	2,850	$9,520	$3.34	4	2,680	$9,550	$3.56
Quartzite	5	2,640 r/	15,000	5.67 r/	6	2,740	16,200	5.90
Total	XX	5,490 r/	24,500	4.46 r/	XX	5,420	25,700	4.74

r/ Revised. XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Excludes miscellaneous stone from State total to avoid disclosing company proprietary data.

3/ Excludes granite and miscellaneous stone from State total to avoid disclosing company proprietary data.

TABLE 4
SOUTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate and concrete products 2/	902	$4,680	$5.18
Asphaltic concrete aggregates and other bituminous mixtures	256	1,010	3.95
Road base and coverings 3/	4,100	10,500	2.56
Fill	618	1,140	1.85
Snow and ice control	32	117	3.66
Other 4/	54	190	3.52
Unspecified: 5/			
Actual	691	2,620	3.79
Estimated	2,080	5,940	2.86
Total or average	8,730	26,200	3.00

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement).

4/ Includes railroad ballast.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
SOUTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	313	1,830	W	W	W	W	312	1,340
Asphaltic concrete aggregates and road base materials	--	--	W	W	W	W	129	366
Roadbase and coverings 3/	870	1,780	841	2,130	842	2,210	1,540	4,380
Fill	--	--	5	9	145	338	469	796
Snow and ice control	4	43	--	--	--	--	28	74
Railroad ballast	--	--	--	--	W	W	--	--
Other miscellaneous uses	8	13	112	676	328	1,610	10	49
Unspecified: 4/								
Actual	153	436	69	115	52	140	417	1,930
Estimated	476	1,460	534	1,500	446	1,330	625	1,670
Total	1,820	5,550	1,560	4,430	1,810	5,620	3,530	10,600

W Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses."

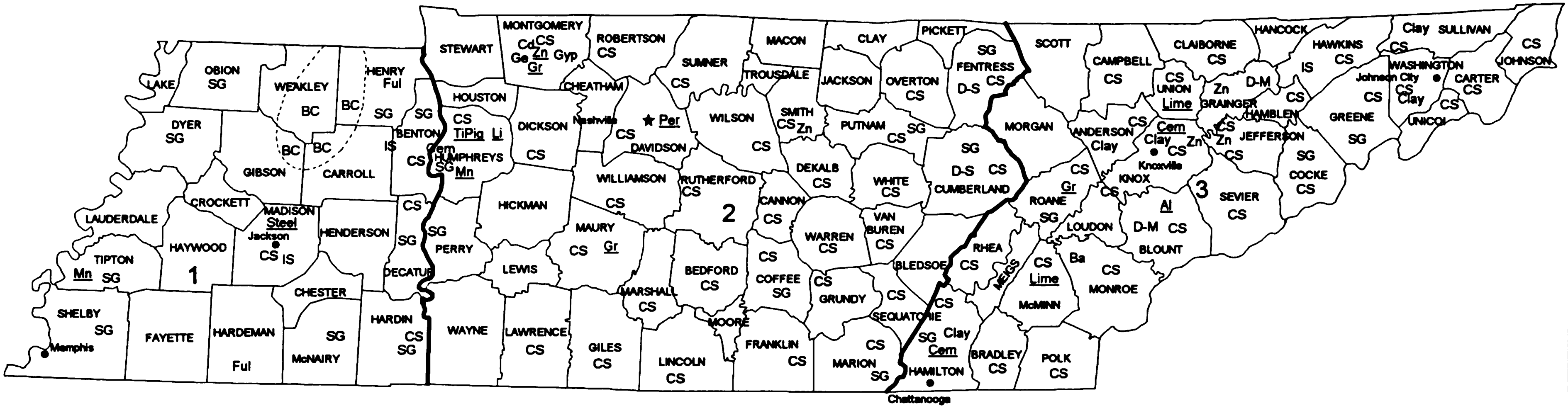
1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes fill and road and other stabilization (cement).

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TENNESSEE



LEGEND

- ——— State boundary
- ——— County boundary
- ★ Capital
- ● City
- 1 ━━━ Crushed stone/sand and gravel districts

MINERAL SYMBOLS

Al	Aluminum plant	CS	Crushed stone	Gyp	By-product gypsum	SG	Sand and gravel
Ba	Barite	D-M	Dimension marble	IS	Industrial sand	Steel	Steel plant
BC	Ball clay	D-S	Dimension sandstone	Li	Lithium plant	TiPig	Titanium dioxide pigment plant
Cem	Cement plant	Ful	Fuller's earth	Lime	Lime plant	Zn	Zinc
Clay	Clay	Gem	Freshwater pearls and shells	Mn	Manganese dioxide plant	Zn	Zinc refinery (Cd by-product cadmium) (Ge by-product germanium)
		Gr	Graphite plant	Per	Perlite plant		

◌ Concentration of mineral operations

0 50 Kilometers

Source: Tennessee Division of Geology/U.S. Geological Survey

THE MINERAL INDUSTRY OF TENNESSEE

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey, and the Tennessee Division of Geology for collecting information on all nonfuel minerals.

In 1996, Tennessee ranked 19th for the fifth time in the past 6 years among the 50 States in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was more than $651 million, a nearly 5% decrease from that of 1995. This followed a 13.5% increase from 1994 to 1995 (based on final 1995 data). The State accounted for a little less than 2% of the U.S. total nonfuel mineral production value.

Crushed stone, by value, has been Tennessee's leading commodity for more than 25 years, except for 1981 when zinc was first. In 1996, crushed stone accounted for about 45% of the State's total nonfuel mineral production value. A decrease in zinc production value, aided by a smaller decrease in gemstones accounted for most of the State's drop in nonfuel mineral value in 1996. A nearly $6-million increase in the value of crushed stone, together with smaller increases in construction sand and gravel, ball clays, and portland cement, moderated the year's drop in value. Compared with 1995, other mineral commodities that increased in value in 1996 were lime, masonry cement, and barite. Others that decreased in value were industrial sand and gravel, common clays, kaolin, dimension stone, copper, lead, and silver. In 1995, most all commodities increased in value. In descending order (largest increase to smallest), the values of zinc, crushed stone, portland cement, and gemstones, led the way; while construction sand and gravel showed a small decrease.

Compared with USGS estimates of the quantities produced in the other 49 States in 1996, Tennessee remained the leading gemstone- and ball clay-producing State, second in zinc, and seventh in fuller's earth clays. In addition, the State's minerals industry produced significant quantities of crushed stone, portland cement, lime, industrial sand and gravel, masonry cement, and common clays, in descending order of value. Primary aluminum and raw steel were produced in Tennessee but processed from materials obtained from other domestic and foreign sources. The State ranked 12th in the production of primary aluminum.

The following narrative information was provided by the Tennessee Division of Geology.[2] Although production was estimated to be down, the State's zinc mining industry had another active year in 1996. Savage Zinc Co., a U.S. subsidiary of Savage Resources Ltd. (Australia), continued operation of the Elmwood-Cumberland-Gordonsville mining and milling operations in middle Tennessee and the electrolytic refinery in Clarksville. Savage continued operation of the Clinch Valley Mine (formerly the Idol Mine) in east Tennessee and closed the Jefferson City zinc mine (formerly U.S. Steel's old Davis Mine) in November. Savage sold the Jefferson City Mine to the Mossy Creek Mining Co., which will close the mine and make the surface available for commercial development. ASARCO Incorporated continued its operation of the Coy, Immel, and Young Mines in east Tennessee; however, its New Market Mine is temporarily closed.

In the Coker Creek gold district of Monroe County in southeast Tennessee, the East Coast Prospector's Club continued to maintain leases on two tracts of land where members mine placer gold using portable dredges and pans. Coker Creek Village operated a pan-for-fee operation for naturally occurring placer gold. Although the amount of gold produced in the district is small relative to other gold districts in the United States, recreational gold mining has a positive effect on the local tourist economy.

In the aggregate industry, Tennessee's major crushed stone producers included ASARCO (American Limestone Co.), Cornerstone Construction & Materials Inc. (The Stone Man Inc., etc.), Hoover Inc., Rogers Group Inc., and Vulcan Materials Co. Sand and gravel was dredged from the Tennessee River in the western part of the State by the following companies: SanGravl Co. Inc., Teague Brothers Sand and Gravel Inc., Tinker Sand and Gravel Inc., and Vulcan Materials Co. The major sand and gravel producer in east Tennessee is the Nolichucky Sand Co., which crushes rock from an alluvial deposit in Greene County.

Tennessee's clay industry was also very active in 1996. General Shale Products Corp. mined shale and clay to supply its brick plants at Chattanooga, Johnson City, and Kingsport in east Tennessee. Four companies mined and processed ball clay in west Tennessee: H. C. Spinks Co., Kentucky-Tennessee Clay Co., Old Hickory Clay Co., and United Clays, Inc. (formerly Cypress Industrial Minerals Co.).

High-silica sand, chiefly for the glass industry, was mined and processed in east Tennessee by Short Mountain Silica Co. and in west Tennessee by the Morie Sand Co. Unimin Corp., a major producer of quartz, kaolin, and feldspar in North Carolina, acquired the Morie Mine and plant in November and will operate the west Tennessee facilities as Tennessee Silica.

Two companies produced dimension marble in east Tennessee during 1996. The Imperial Black Marble Co. quarried and processed marble at Thorn Hill in Union

County, and the Tennessee Marble Co. produced tile and dimension stone at its Friendsville plant in Blount County. Tennessee Marble does not currently operate a quarry because it has an abundant supply of marble blocks on its Friendsville property that were quarried by previous operators.

Quartzitic sandstone was produced on the Cumberland Plateau. Products included dimension stone, field stone, rough broken stone, ashlar, flagstone, and rubble. Although there were a number of individuals who quarried the sandstone, there were three companies that quarried, sawed, and fabricated the sandstone: Cumberland Mountain Stone Co., Silvara Stone Co., and Tennessee Building Stone Inc.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN TENNESSEE 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays 3/	665	28,600	664	29,000	687	31,400
Gemstones	NA	23,100	NA	35,400	NA	W
Sand and gravel:						
Construction	8,710	38,000	8,020	36,700	8,530	40,100
Industrial	660	11,600	918	14,700	818	13,400
Stone (crushed)	49,200	265,000	52,600	286,000	53,000	292,000
Combined value of barite, cement, clays [bentonite (1994), common, fuller's earth, kaolin (1995)], copper (1994-95), lead (1994-95), lime, silver (1994-95), stone (dimension), zinc, and value indicated by symbol W	XX	235,000	XX	282,000	XX	275,000
Total	XX	602,000	XX	683,000	XX	651,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value" data.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Robin C. Hale, Chief Geologist (Knoxville), authored the text of mineral industry information submitted by the Tennessee Division of Geology. He may be contacted at the Tennessee Department of Conservation, Division of Geology, 2700 Middlebrook Pike, Suite 230, Knoxville, TN 37921-5602, telephone: (423) 594-6200, Fax: (423) 594-6105.

TABLE 2
TENNESSEE: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	1,200	$5,820	$4.85
Filter stone	321	1,610	5.01
Other coarse aggregate 3/	276	1,160	4.22
Coarse aggregate, graded:			
Concrete aggregate, coarse	3,490	17,400	4.99
Bituminous aggregate, coarse	10,200	54,800	5.39
Bituminous surface-treatment aggregate	1,640	9,640	5.89
Railroad ballast	351	1,660	4.73
Other graded coarse aggregate	982	5,510	5.61
Fine aggregate (-3/8 inch):			
Stone sand, concrete	740	5,730	7.74
Stone sand, bituminous mix or seal	237	1,610	6.80
Screening, undesignated	2,960	16,900	5.70
Other fine aggregate	405	2,170	5.35
Coarse and fine aggregates:			
Graded road base or subbase	11,800	60,700	5.16
Unpaved road surfacing	915	4,620	5.05
Crusher run or fill or waste	2,130	9,980	4.68
Other construction materials 4/	1,580	9,320	5.92
Agricultural:			
Agricultural limestone	431	2,600	6.03
Poultry grit and mineral food	W	W	11.32
Other agricultural uses	W	W	8.67
Chemical and metallurgical:			
Cement manufacture	W	W	5.36
Lime manufacture	W	W	14.36
Chemical stone	W	W	9.29
Sulfur oxide removal	W	W	4.80
Special:			
Mine dusting or acid water treatment	W	W	21.29
Asphalt fillers or extenders	W	W	9.67
Other fillers or extenders	W	W	12.86
Unspecified: 5/			
Actual	4,610	22,500	4.88
Estimated	5,100	24,700	4.86
Total	52,600	286,000	5.43

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Includes dolomite, granite, limestone, miscellaneous stone, and sandstone.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes macadam.

4/ Includes other coarse and fine aggregates.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
TENNESSEE: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994				1995			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	103 r/	42,800 r/	$233,000 r/	$5.46 r/	102	46,400	$254,000	$5.48
Dolomite	11 r/	W	W	4.92 r/	11	W	W	5.04
Granite	1	W	W	4.96	1	W	W	4.43
Sandstone	2 r/	W	W	5.52	2	W	W	6.61
Miscellaneous stone	1	W	W	5.44	1	W	W	5.56
Total	XX	49,200	265,000	5.39	XX	52,600	286,000	5.43

r/ Revised. W Withheld to avoid disclosing proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 4
TENNESSEE: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

Use	District 2		District 3	
	Quantity	Value	Quantity	Value
Construction aggregates:				
Coarse aggregate (+1 1/2 inch) 3/	1,150	5,290	650	3,300
Coarse aggregate, graded 4/	9,290	48,200	7,330	40,800
Fine aggregate (-3/8 inch) 5/	2,240	12,000	2,110	14,400
Coarse and fine aggregate 6/	9,730	46,500	6,670	38,200
Agricultural 7/	W	W	W	W
Chemical and metallurgical 8/	W	W	W	W
Special 9/	W	W	W	W
Unspecified 10/				
Actual	3,170	16,300	1,450	6,200
Estimated	3,440	16,500	1,660	8,240
Total	30,900	156,000	21,700	130,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Production reported in District 1 was included with "District 2" to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), other coarse and fine aggregates, and other construction materials.

7/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

8/ Includes cement manufacture, chemical stone for alkali works, lime manufacture, and sulfur oxide removal.

9/ Includes asphalt fillers or extenders, mine dusting or acid water treatment, and other fillers or extenders.

10/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
TENNESSEE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	2,800	$13,100	$4.69
Plaster and gunite sands	320	1,970	6.17
Concrete products (blocks, bricks, pipe, decorative, etc.)	261	1,240	4.76
Asphaltic concrete aggregates and other bituminous mixtures	1,110	6,360	5.72
Road base and coverings 2/	1,570	5,120	3.27
Fill	148	831	5.61
Snow and ice control	17	156	9.18
Other 3/	79	498	6.30
Unspecified: 4/			
Actual	435	3,050	7.01
Estimated	1,290	4,350	3.38
Total or average	8,020	36,700	4.58

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Includes filtration.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
TENNESSEE: CONSTRUCTION SAND AND GRAVEL 1/ SOLD OR USED IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 3/	1,830	7,720	1,550	8,620
Asphaltic bituminous mixtures	719	3,790	393	2,570
Road base and coverings 4/	1,450	4,390	282	1,720
Other miscellaneous uses 5/	--	--	79	498
Unspecified: 6/				
Actual	387	2,520	48	527
Estimated	713	1,840	574	2,500
Total	5,100	20,300	2,920	16,400

1/ Production reported in District 3 was included with "District 2" to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

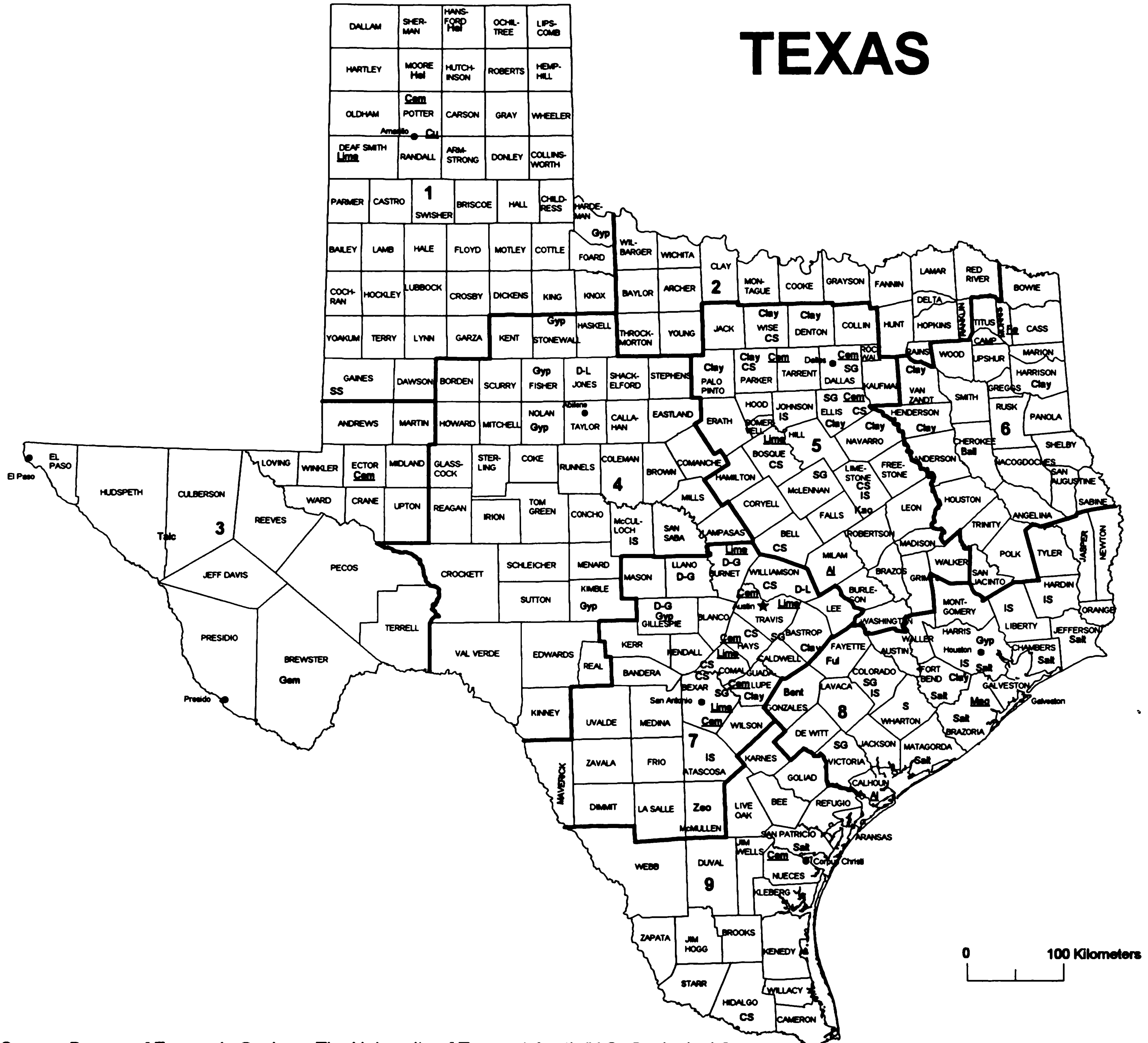
3/ Includes plaster and gunite sands.

4/ Includes fill, road and other stabilization (cement), and snow and ice control.

5/ Includes filtration.

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TEXAS



LEGEND

- State boundary
- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS

Al	Aluminum plant
Ball	Ball clay
Bent	Bentonite
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper plant
D-G	Dimension granite
D-L	Dimension limestone
Fe	Iron ore and/or scrap steel plant
Ful	Fuller's earth
Gem	Gemstones
Gyp	Gypsum
Hel	Helium
IS	Industrial sand
Kao	Kaolin
Lime	Lime plant
Mag	Magnesium metal from seawater
S	Sulfur
Salt	Salt
SG	Sand and gravel
SS	Sodium saltate
Talc	Talc
Zeo	Zeolites

Source: Bureau of Economic Geology, The University of Texas at Austin/U.S. Geological Survey

THE MINERAL INDUSTRY OF TEXAS

This chapter has been prepared under a Memorandum of Understanding between tbe U.S. Geological Survey, and the Bureau of Economic Geology, The University of Texas at Austin, for collecting information on all nonfuel minerals..

Texas rose in rank from sixth to fifth in the Nation in total nonfuel mineral production value[1] in 1996, according to the U.S. Geological Survey (USGS). The estimated value for 1996 was almost $1.8 billion, a 6% increase from that of 1995. This followed an 9.1% increase from 1994 to 1995 (based on final 1995 data). The State accounted for more than 4.5% of the total U.S. nonfuel mineral production value.

More than 85% of the State's nonfuel mineral value came from the mining and processing of industrial minerals, especially (in descending order of value) portland cement, construction sand and gravel, crushed stone, lime, and salt. Substantial increases in value of the first three plus an increase in the value of magnesium metal accounted for most of the State's increase in total nonfuel mineral value in 1996. Construction sand and gravel, the mineral commodity with the largest change in value, increased 26%, or $71 million. Crushed stone increased by more than $25 million, portland cement by $17 million, and magnesium metal, by more than $16 million. The only significant decrease was Frasch sulfur, which had a $16-million drop in value. Compared with 1995, the following nonfuel mineral values also increased: lime, masonry cement, crude gypsum, sodium sulfate, bentonite clays, ball clays, and magnesium compounds. Other values that decreased were those of salt, industrial sand and gravel, Grade-A helium, common clays, dimension stone, crude helium, talc and pyrophyllite, fuller's earth clays, and gemstones.

Based on USGS estimates of the quantities of minerals produced in the 50 States in 1996, Texas remained first in crushed stone and first of three magnesium metal-producing States; second in portland cement, construction sand and gravel, salt, and common clays; and second in each of two Frasch sulfur, two sodium sulfate, and three crude helium-producing States. The State continued to rank third in gypsum, ball clays, and third of five Grade-A helium-producing States; sixth in lime, bentonite, and magnesium compounds; and eighth in masonry cement. Texas dropped from sixth to seventh in the production of industrial sand and gravel and from seventh to eighth in dimension stone. In 1995, the State was second in zeolites; data were not yet available for 1996.

Magnesium metal, extracted from seawater, was the only metal produced from the State's natural resources. In addition to the production of magnesium metal, the Texas metal industry produced raw steel, primary aluminum, copper, lead, and smaller amounts of other metals. Sources of plant feed included scrap metal and ores acquired from other domestic or foreign sources. Texas was among the top seven States that produced raw steel, with an estimated output of nearly 4.3 million metric tons (more than 4.7 million short tons), as reported by the American Iron and Steel Institute. The State ranked ninth in primary aluminum production.

The following narrative information was provided by the Texas Bureau of Economic Geology[2] (TBEG). The nonfuel mineral industry of Texas continued to grow during 1996. An increase in population and growth in industry helped to spur activity in mineral production by creating a demand for materials used in developing infrastructure. Aggregate and stone production significantly increased in response to a growing demand from new as well as continuing construction projects. The outlook, as projected by the TBEG, was one of continued population increase and commercial development which would result in increasing demand for development of the State's mineral resources.

Texas Employment Commission records showed increases in employment in construction and manufacturing related to mineral products during 1996. The construction job annual growth rate at the end of the third quarter was 4.4%. Manufacturing jobs related to mineral production such as stone, clay, glass products, concrete, and gypsum increased by about 4% compared to the same period in 1995. Texas Workforce Commission statistics indicated a 1-month gain of 700 jobs (0.5 % increase) at the beginning of the fourth quarter. This may indicate a change in the long-term downward trend in mining employment. Overall employment in the mining industry during the first three quarters of 1996 decreased by about 1 .5%.

No significant change occurred in overall exploration for nonfuel minerals in Texas during 1996. The TBEG received several inquiries about possible sources of clays, industrial sands, sand and gravel materials, and crushed stone, but no inquiries about sources of cement materials, lime, or gypsum. Many sources of sand and gravel, especially large deposits, are being depleted, and producers are seeking additional resources. Sources of limestone-based materials are generally plentiful in Texas.

Trinity Materials Inc., based in Beaumont, acquired assets of Brazco Point during 1996. The acquisition includes sand and gravel and base operations in Cleburne and rail yards in Fort Worth and Alvarado.

Titan Resources Inc. acquired a commercial quarry in southeast Houston. This is Titan's entry into the sand and gravel business. The commercial value of all materials in place were valued at more than $40 million

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] L. Edwin Garner, Research Associate, authored the text of mineral industry information submitted by the Bureau of Economic Geology of the University of Texas at Austin..

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN TEXAS 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	258	18,200	202	17,600	228	19,900
Portland	8,620	456,000	8,090	499,000	8,370	516,000
Clays 3/	2,190	13,700	2,450	26,000	2,490	18,000
Gemstones	NA	448	NA	353	NA	W
Gypsum (crude)	1,870	10,100	1,880	16,200	1,870	16,600
Helium (crude) million cubic meters	7	7,050	5	4,730	W	W
Lime	1,210	76,200	1,370	85,800	1,410	88,100
Salt	8,760	76,500	9,110	85,000	8,970	76,100
Sand and gravel:						
Construction	56,700	242,000	61,100	271,000	72,000	342,000
Industrial	1,570	37,900	1,600	40,300	1,570	39,300
Stone:						
Crushed	76,100	300,000	81,100	310,000	86,000	335,000
Dimension metric tons	W	W	54,000	13,300	51,800	12,600
Talc and pyrophyllite do.	225,000	5,860	294,000	5,840	236,000	4,580
Combined value of clays [ball (1994), bentonite, fuller's earth, kaolin (1994)], helium [crude (1996), Grade-A], iron ore [usable (1994)], magnesium compounds, magnesium metal, sodium sulfate (natural), stone [dimension granite and limestone (1994)], sulfur (Frasch), and values indicated by symbol W	XX	295,000	XX	301,000	XX	314,000
Total	XX	1,540,000	XX	1,680,000	XX	1,780,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value" data.

TABLE 2
TEXAS: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	572	$3,700	$646
Filter stone	221	1,440	6.50
Other coarse aggregate 3/	254	951	3.74
Coarse aggregate, graded:			
Concrete aggregate, coarse	13,600	64,300	4.71
Bituminous aggregate, coarse	7,930	37,200	4.69
Bituminous surface-treatment aggregate	1,280	8,840	6.91
Railroad ballast	225	1,190	5.28
Other graded coarse aggregate	W	W	2.77
Fine aggregate (-3/8 inch):			
Stone sand, concrete	2,300	9,990	4.34
Stone sand, bituminous mix or seal	1,840	5,750	3.12
Screening, undesignated	2,180	7,660	3.52
Other fine aggregate	48	165	3.44
Coarse and fine aggregates:			
Graded road base or subbase	22,300	65,200	2.93
Unpaved road surfacing	260	764	2.94
Terrazzo and exposed aggregate	W	W	12.08
Crusher run or fill or waste	1,050	2,500	2.39
Other coarse and fine aggregates	W	W	4.70
Other construction materials 4/	614	3,490	5.69
Agricultural:			
Agricultural limestone	302	1,140	3.77
Poultry grit and mineral food	100	776	7.76
Other agricultural uses	(5/)	(5/)	10.89
Chemical and metallurgical:			
Cement manufacture	10,400	28,200	2.71
Lime manufacture	957	5,360	5.60
Chemical stone	74	422	5.70
Glass manufacture	(5/)	(5/)	6.50
Sulfur oxide removal	572	2,320	4.05
Special:			
Asphalt fillers or extenders	(5/)	(5/)	8.65
Other fillers or extenders	(5/)	(5/)	36.30
Other specified uses not listed	(5/)	(5/)	8.00
Unspecified: 6/			
Actual	909	2,390	2.63
Estimated	11,900	31,700	2.66
Total	81,100	310,000	3.82

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Includes calcareous marl, dolomite, granite, limestone, marble, miscellaneous stone, sandstone, traprock, and volcanic cinder and scoria.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes macadam.

4/ Includes waste material.

5/ Withheld to avoid disclosing company proprietary data; included in "Total."

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
TEXAS: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	111 r/	72,700 r/	$285,000	$3.93 r/	110	76,100	$291,000	$3.82
Dolomite	1	W	W	2.84	1	W	W	2.83
Marble	20	W	W	W	20	W	W	W
Calcareous marl	2	W	W	1.76	2	W	W	2.13
Granite	14	4	W	W	14	W	W	W
Traprock	2 r/	W	W	6.95 r/	2	W	W	4.20
Sandstone	7 r/	805 r/	5,690 r/	7.07 r/	6	1,100	W	W
Volcanic cinder and scoria	1	W	W	5.47	1	W	W	5.39
Miscellaneous stone	4 r/	514 r/	1,960 r/	3.81 r/	4	986	2,410	2.44
Total	XX	76,100	300,000	3.95	XX	81,100	310,000	3.82

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 4
TEXAS: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

	District 1		District 4		District 5		District 7	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 3/	(4/)	3	283	1,420	221	1,560	542	3,100
Coarse aggregate, graded 5/	59	392	1,830	10,900	9,250	47,500	12,000	52,700
Fine aggregate (-3/8 inch) 6/	10	11	394	1,940	1,880	5,670	4,080	15,900
Coarse and fine aggregate 7/	88	287	1,660	5,440	4,490	18,600	15,800	41,800
Agricultural 8/	--	--	--	--	(10/)	(10/)	(10/)	(10/)
Chemical and metallurgical 9/	--	--	(10/)	(10/)	(10/)	(10/)	7,450	22,700
Special 11/	--	--	--	--	(10/)	(10/)	(10/)	(10/)
Unspecified: 12/								
Actual	--	--	(10/)	(10/)	(10/)	(10/)	--	--
Estimated	1,080	2,830	2,110	5,380	7,350	19,700	969	2,540
Total	1,230	3,520	7,630	28,600	28,200	114,000	41,400	157,000

	District 8		District 9		Unspecified within all districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	--	--	--	--	--	--
Coarse aggregate, graded 5/	--	--	--	--	8	66
Fine aggregate (-3/8 inch) 6/	--	--	--	--	5	42
Coarse and fine aggregate 7/	--	--	1,990	5,230	189	520
Agricultural 8/	--	--	--	--	--	--
Chemical and metallurgical 9/	--	--	--	--	--	--
Special 11/	--	--	--	--	--	--
Unspecified: 12/						
Actual	--	--	--	--	--	--
Estimated	367	966	49	228	--	--
Total	367	966	2,040	5,450	202	628

1/ Production reported in District 2 and 3 was included with "District 4"; District 6 was included with "District 5" to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

4/ Less than 1/2 unit.

5/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, other graded coarse aggregate, other construction materials, and waste material.

6/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

7/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

8/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

9/ Includes cement manufacture, chemical stone for alkali works, glass manufacture, lime manufacture, and sulfur oxide removal.

10/ Withheld to avoid disclosing company proprietary data; included in "Total."

11/ Includes asphalt fillers or extenders, other fillers or extenders, and other specified uses not listed.

12/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
TEXAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	20,700	$102,000	$4.94
Plaster and gunite sands	503	2,450	4.87
Concrete products (blocks, bricks, pipe, decorative, etc.)	201	693	3.45
Asphaltic concrete aggregates and other bituminous mixtures	1,820	9,320	5.11
Road base and coverings 2/	2,960	11,400	3.84
Fill	6,080	11,900	1.96
Other 3/	530	942	1.78
Unspecified: 4/			
Actual	11,100	62,500	5.62
Estimated	17,200	69,500	4.05
Total or average	61,100	271,000	4.43

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement and lime).

3/ Includes roofing granules.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
TEXAS: CONSTRUCTION SAND AND GRAVEL 1/ SOLD OR USED IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 3		District 4		District 5	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 3/	761	4,960	(4/)	(4/)	346	2,410	7,650	43,500
Asphaltic concrete aggregates and road base materials 5/	1,020	5,410	(4/)	(4/)	69	254	3,020	7,730
Other miscellaneous uses 6/	3	18	--	--	8	66	--	--
Unspecified: 7/								
Actual	58	282	32	192	663	4,260	4,990	30,600
Estimated	1,110	4,690	355	1,730	1,670	9,790	2,990	10,800
Total	2,950	15,400	1,880	9,620	2,760	16,800	18,700	92,600

Use	District 6		District 7		District 8		District 9	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 3/	(4/)	(4/)	2,040	8,140	7,430	28,500	1,610	9,690
Asphaltic concrete aggregates and road base materials 5/	(4/)	(4/)	1,530	2,610	3,990	10,100	960 8/	5,290 8/
Other miscellaneous uses 6/	--	--	--	--	519	858	--	--
Unspecified: 7/								
Actual	--	--	1,860	9,490	2,610	12,000	902 8/	5,680 8/
Estimated	648	3,050	1,990	7,790	7,320	26,800	1,070	4,910
Total	1,010	4,710	7,420	28,000	21,900	78,200	4,550 8/	25,600 8/

1/ Production reported in District 2 was included with "District 3" to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes plaster and gunite sands.

4/ Withheld to avoid disclosing company proprietary data; included in "Total."

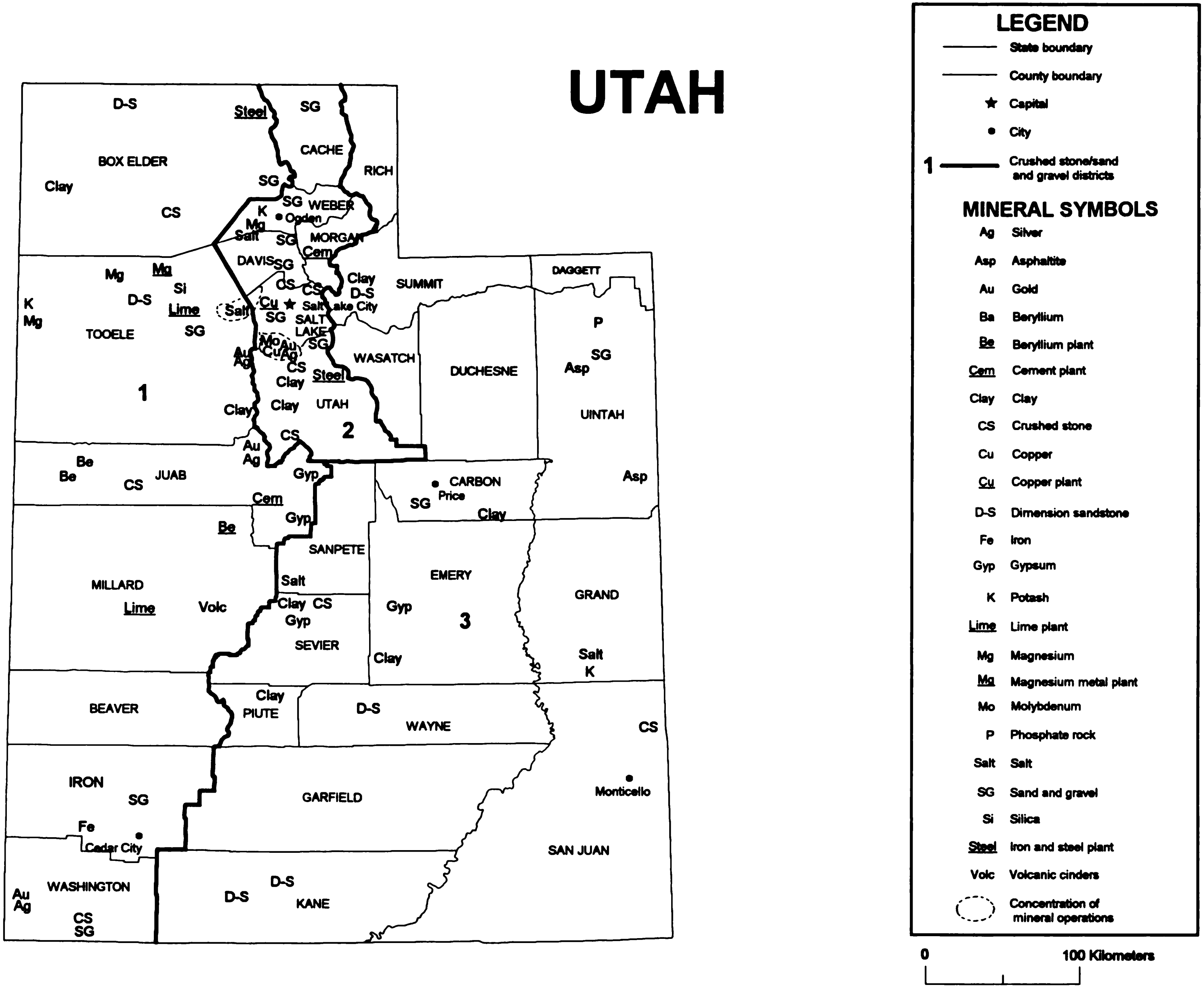
5/ Includes fill and road and other stabilization (cement and lime).

6/ Includes roofing granules.

7/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

8/ Includes unspecified within all districts.

UTAH



Source: Utah Geological Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF UTAH

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Utah Geological Survey for collecting information on all nonfuel minerals.

In 1996, Utah ranked seventh nationally in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The State was fourth in 1995. The estimated value for 1996 was about $1.56 billion, a decrease of approximately 16% from that of 1995. This followed a 21.7% increase from 1994 to 1995 (based on final 1995 data). The State accounted for more than 4% of the U.S. total nonfuel mineral production value.

Metals accounted for nearly four-fifths of Utah's nonfuel mineral production value, copper being more than half of the State's entire metal value. In 1996, a decrease in the value (unit price and production) of copper accounted for the largest portion of the State's decrease in nonfuel mineral value with molybdenum and salt also showing significant decreases. Compared with 1995, nonfuel mineral values that increased in 1996 included, in descending order of value, gold, magnesium metal, construction sand and gravel, lime, silver, phosphate rock, magnesium compounds, grade-A helium, gemstones, common clays, iron ore, gypsum (crude), and masonry cement. Other values that decreased were those of portland cement, potash, and crushed stone. In 1995, an increase in copper value together with smaller yet large increases in molybdenum, magnesium metal, potash, and construction sand and gravel values accounted for much of the year's increase in value.

Based on USGS estimates of the quantities produced in the United States during 1996, Utah remained the only State to produce beryllium concentrates; second in copper and second of four potash-producing States; third in gold and magnesium metal; fourth in silver, phosphate rock and magnesium compounds; sixth in salt; and seventh in bentonite clays. Utah rose from third to second in molybdenum production.

The following narrative information was provided by the Utah Geological Survey (UGS) (Bon, Gloyn, and Tabet, 1997). Production data in the following text are those reported by the UGS, based on its own surveys and estimates. They differ from some production figures reported to the USGS. Significant price increases for copper in 1994 and 1995 pushed its value to historic highs and the value of base metal production statewide to more than $1 billion for the first time in 1995. Copper production from Kennecott Utah Copper Corp.'s Bingham Canyon Mine in Salt Lake County decreased about 2% in 1996 to about 295,000 metric tons[2] of copper in concentrate. Since 1990, annual copper production has ranged from a low of 227,000 tons to the 1994 high of more than 299,000 tons. With the completion of the modernization and expansion program that began in 1988, Kennecott's copper production has stabilized at a rate of about 300,000 tons annually.

Magnesium metal was the second-largest contributor to the value of base metals in 1996. Magnesium metal is produced from Great Salt Lake brines by Magnesium Corp. of America (Magcorp) at its electrolytic plant at Rowley in Tooele County. The plant has a capacity to produce 38,000 tons of magnesium metal (99.9% purity) annually and is the fourth largest magnesium plant in the world. Utah magnesium production remained steady in 1996, while prices declined primarily because of increased foreign competition.

Utah continued to be the Nation's leading producer of beryllium metal. Beryllium ore (bertrandite) was mined at Brush Wellman Inc.'s Topaz Mine in Juab County and processed with domestic and imported beryl at the company's plant about 5 kilometers north of Delta in Millard County. In 1996, more than 181 tons of beryllium hydroxide were produced at the Delta plant and sent to the company-owned refinery and finishing plant in Ohio. Production of beryllium hydroxide in 1996 was projected to be similar to 1995 production. The demand for beryllium alloys and beryllium oxide has increased modestly over the past several years because alloys are being introduced into components for the automobile and electronics industries. The demand for beryllium metal has decreased as national defense requirements have declined.

The sole molybdenum producer in Utah is Kennecott's Bingham Canyon Mine, which produced about 18,000 tons of molybdenum concentrate in 1996. The Bingham Canyon Mine was 1 of only 11 molybdenum producers in the United States in 1995. Molybdenum is recovered as a byproduct of copper mining, and its production is dependent on the amount of copper ore processed. A strong demand for molybdenum was forecast for 1997.

The only iron ore mine in Utah is Geneva Steel's operation west of Cedar City in Iron County. The ore is used in Geneva's steelmaking facility at Vineyard, Utah County. In 1996, the company did not produce any iron ore. The change from an open-hearth process to the new Q-BOP process for steelmaking at the Geneva plant has increased the use of higher iron, lower silica-content taconite pellets from Minnesota and decreased the use of lower iron-content ore from their Cedar City Mine over the past several years. The process change has also decreased the use of limestone from the company's Utah County limestone quarry.

Gold production in 1996 was estimated to be about 24 tons. Gold was produced from four surface mines, three of which are primary producers, and one is a byproduct operation. In descending order of production they are Kennecott's Bingham Canyon Mine, Barrick Gold Corp.'s Mercur Mine, Kennecott's Barney's Canyon Mine, and USMX Inc.'s Goldstrike Mine. North Lily Mining Co.'s North Lily mine-dump-leach operation closed in 1996. In 1996, only one mine had an increase in production from 1995 and three mines experienced a decrease in production. In 1995, the Bingham Canyon Mine was the third largest gold producer in the United States.

The Goldstrike Mine in Washington County discontinued mining operations in 1994; however, a small amount of gold was recovered from active leach dumps before the mine closed in mid-1996. The Mercur Mine in Tooele County will phase out its mining operation during the next several years because of reserve depletion and will produce at lower levels until mining and leaching are completed.

In 1996, silver production was estimated at about 149 tons. Silver was produced as a secondary metal by all but one (Barney's Canyon Mine) of the primary gold producers and as a byproduct metal by Kennecott's Bingham Canyon Mine. Kennecott is by far the largest silver producer in the State.

Industrial minerals continued to be an important contributor to Utah's mineral industry. Major commodities produced include salt, magnesium chloride, potash (potassium chloride) and sulfate of potash (SOP), sand and gravel, crushed stone, portland cement, lime, limestone, dolomite, phosphate, gilsonite, common clay and bentonite, and gypsum. Commodities produced in lesser amounts include fuller's earth, building stone, decorative stone, lightweight aggregate, masonry cement, and gemstones.

Salt and brine-derived products are the largest contributors to the value of industrial minerals in Utah. In addition to salt, other brine-derived products include magnesium chloride and potash in the form of both potassium chloride and potassium sulfate, or sulfate of potash. Most salt production came from three operators using brine from Great Salt Lake. These operators were, in descending order of production, GSL Minerals Inc., Morton Salt Co., and Akzo Nobel Salt Inc. In addition, three other companies produce salt and/or potash from operations not related to the Great Salt Lake: Reilly Chemical Co. at Wendover in Tooele County, Moab Salt Co. near Moab in Grand County, and Redmond Clay and Salt Co. near Redmond in Sanpete and Sevier Counties (salt only). Potassium chloride, or muriate of potash, was produced by two operators, Reilly Chemical Co. and Moab Salt Co. at their above-mentioned facilities. The production of salt and brine-derived products is expected to continue to expand over the next several years. GSL Minerals, the largest potassium sulfate or SOP producer in North America, plans to double production from the current level of 270,000 tons per year within the next 5 years.

Sand and gravel and crushed stone were the second highest value industrial minerals produced in 1996. These materials are produced by commercial operators and by State and county agencies in every county in Utah. Because of the large number and diversity of producers, operators are not sent UGS production questionnaires. However, data are compiled by the USGS.

Portland cement and lime were respectively the third and fourth highest value industrial minerals produced in 1996. Two operators produce portland cement in Utah: Holnam Inc. and Ash Grove Cement Co. Holnam's Devil's Slide plant is east of Morgan in Morgan County, and Ash Grove's Leamington plant is east of Lynndyl in Juab County. The two plants have a combined capacity of more than 900,000 tons of cement annually. Both companies have plans underway to increase cement production over the next 2 years.

Lime usage continues to expand. Continental Lime Inc., which produces high-calcium lime, and Chemical Lime Co., which produces dolomitic lime, are the two suppliers of calcined limestone (quicklime) and hydrated lime in Utah, with a combined capacity of more than 900,000 tons per year. Both operations serve markets in Utah and surrounding States. Continental Lime's plant is in the Cricket Mountains, approximately 56 kilometers southwest of Delta in Millard County, and is rated 1 of the 10 largest lime plants in the United States. Chemical Lime of Arizona's plant is near Grantsville in Tooele County.

Two companies produced less than 90,000 tons of limestone in 1996. In descending order of production, they are Cotter Corp.'s Papoose Mine in San Juan County and Emery Industrial Resources' Cherry Hill Park Mine in Utah County. Their production compares with more than 163,000 tons of limestone produced in 1995 by five operators. Three of the five operators who produced limestone in 1995 were idle in 1996. Limestone is used primarily for reducing fluestack emissions in electric power generation plants and also for aggregate in the construction industry.

Geneva Steel produces about 181,000 tons per year of dolomite from a quarry located near the southeast end of Utah Lake in Utah County. The majority of the dolomite is used in the blast furnace operation at the Geneva plant, while the remainder is crushed to a fine powder and marketed as a product named "rock dust" for use as a coal-dust suppressant in underground coal mines.

Utah's only phosphate operation, SF Phosphates Ltd. Co.'s Vernal Phosphate Operation, is 18 kilometers north of Vernal in Uintah County. SF Phosphates Ltd. is a partnership comprising Farmland Industries Inc. of Kansas City, MO, and J.R. Simplot Inc. of Boise, ID. The company mines roughly 2.3 million tons of ore annually, which is processed into about 900,000 tons of concentrate and transported in slurry form to the company's Rock Springs, WY, fertilizer plant via a 145-kilometer-long, underground pipeline. The mine operates at a nearly constant annual rate because its product is used exclusively in its company-owned manufacturing facility. Production for 1996 is the highest in the past several years.

Gilsonite production for 1996 is estimated at about 54,000 tons, the same as in 1995. Gilsonite is an unusual solid hydrocarbon that has been mined in Utah for more than 100 years. The three operations which produce gilsonite are all near the town of Bonanza in Uintah County. In descending order of production they are American Gilsonite Co.'s Bonanza Mine, Zeigler Chemical and Minerals Co.'s Zeigler Mine, and Lexco Inc.'s Lexco Mine. Gilsonite is used in more than 150 products ranging from printing inks to explosives and is marketed worldwide.

More than 254,000 tons of structural clay and more than 36,000 tons of bentonite were produced by five companies in 1996. This is a slight decrease from the nearly 272,000 tons of clay produced in 1995. Bentonite production was essentially the same as last year. In descending order of production, the companies are Interstate Brick Co., ECDC Environmental LC, Redmond Clay and Salt Co., Interpace Industries, and Western Clay Co. Clay is used primarily in the manufacture of bricks and as a sealant for open pit storage of drilling fluids and oil, heap-leach pads in the mining industry, irrigation ditches, and industrial and municipal waste landfills. Bentonite is used primarily as a drilling mud in the oil and gas industry, as a pet-waste absorbent, and as a sealant in civil engineering applications.

Nearly 272,000 tons of gypsum were produced by six companies in 1996, 54,000 tons more than 1995 production. In descending order of production the companies are U.S. Gypsum Co., Georgia Pacific Corp., Thomas J. Peck & Sons, D.K. Gypsum Industries, H.E. Davis & Sons Inc., and Western Clay Co. In 1995, Georgia Pacific Corp. reopened its wallboard plant, which had been idle since 1992, near Sigurd in Sevier County. The majority of gypsum produced in Utah is used for making wall board, but several small operators supply raw gypsum to regional cement companies where it is used as an additive to retard the setting time of cement and to the agriculture industry for use in animal feed.

Utah's coal industry achieved yet another production record in 1996 with a total of more than 24 million tons, 8% above last year's record. Coal production came from 12 underground mines operated by 6 companies in 3 central Utah counties. Emery County was the leading coal producing county (62%), followed by Carbon (22%), and Sevier (16%) Counties. The value of Utah coal sold in 1996 exceeded $500 million.

Although no uranium mines were active in Utah in 1996, U.S. Energy Inc. has applied to the Nuclear Regulatory Commission to change the status of its 900,000-ton-per-day Shootaring Canyon uranium mill in Garfield County from standby to operational. Approval is expected by mid-1997 with production to start soon afterwards.

During 1996, the Utah Division of Oil, Gas and Mining (DOGM) received nine Regular Mine permit applications (2 hectares, or 5 acres, and larger disturbance) and 35 new Small Mine permit applications (less than 2 hectares, or 5 acres' disturbance). Five applications were made to change from Small Mine to Regular Mine status.

In December 1996, 410 annual report questionnaires were sent to active large and small mine operators. By mid-February, 249 reports had been received by the division. Of the mines reporting, 43 large mines, 12 coal mines, and 53 small mines reported production. Several reporting mines produced more than one commodity.

Mineral exploration for base and precious metals in Utah showed some improvement over 1995, but still remained at relatively modest levels. DOGM received 31 new Notices of Intent to Explore (NOI) in 1996. Nearly 70% of these was for precious metals, mostly in Tooele, Beaver, and Millard Counties; about 10% was for base metals. In addition to the new NOI's, exploration was also done in areas previously permitted, such as the Oquirrh Mountains in Salt Lake and Tooele Counties, the Tintic district in Juab and Utah Counties, and near Milford in Beaver County. Although most exploration took place in a few well-known mining districts, many of the new exploration areas are more scattered throughout the State. In addition to precious metals, targets for base metals included skarn, porphyry, breccia pipe, sedimentary copper deposits, and lead-zinc-silver limestone replacement deposits.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] All tons are metric tons unless otherwise specified.

Reference Cited

Bon, R.L., Gloyn, R.W., and Tabet, D.E., *1996 Summary of Mineral Activity in Utah, March, 1997, 14pp.*

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN UTAH 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1994 Quantity	1994 Value	1995 Quantity	1995 Value	1996 p/ Quantity	1996 p/ Value
Beryllium concentrates	metric tons	4,330	5	5,040	6	5,430	6
Clays		243 3/	3,410 3/	424	4,280 3/	477	4,440 3/
Gemstones		NA	620	NA	939	NA	W
Iron ore (usable)		W	W	144	1,700	W	W
Salt		1,680	56,700	2,160	54,800	2,030	30,100
Sand and gravel (construction)		21,100	69,600	23,800	80,200	27,000	97,200
Stone (crushed)		4,540	19,800	4,140	14,800	3,800	13,900
Combined value of cement, clays (bentonite), copper, gold, gypsum (crude), helium (Grade-A), lime, magnesium compounds, magnesium metal, mercury, molybdenum, phosphate rock, potash, silver, stone [dimension (1995), dimension quartzite and sandstone (1994, 1996)], and values indicated by symbol W		XX	1,370,000	XX	1,700,000	XX	1,410,000
Total		XX	1,520,000	XX	1,850,000	XX	1,560,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.
1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/ Data are rounded to three significant digits; may not add to totals shown.
3/ Excludes certain clays; kind and value included with "Combined value" data.

TABLE 2
UTAH: 1/ CRUSHED STONE 2/ SOLD OR USED
BY PRODUCERS IN 1995, BY USE 3/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Fine aggregate (-3/8 inch):			
Screening, undesignated	2	$8	$4.00
Coarse and fine aggregates:			
Graded road base or subbase	55	284	5.16
Unpaved road surfacing	41	214	5.22
Other construction materials	3	17	5.67
Agricultural:			
Agricultural limestone	3	83	27.67
Poultry grit and mineral food	W	W	28.29
Chemical and metallurgical:			
Cement manufacture	W	W	4.65
Lime manufacture	200	1,320	6.60
Flux stone	W	W	5.97
Special: Mine dusting or acid water treatment	W	W	4.38
Unspecified: 4/			
Actual	1,950	4,820	2.47
Estimated	446	1,100	2.47
Total	4,140	14,800	3.58

W Withheld to avoid disclosing company proprietary data; included in "Total."
1/ To avoid disclosing company proprietary data; "District tables were not produced in 1995."
2/ Includes dolomite, limestone, limestone-dolomite, sandstone, and quartzite.
3/ Data are rounded to three significant digits; may not add to totals shown.
4/ Includes production reported without a breakdown by use and estimates for nonrespondents.

TABLE 3
UTAH: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994				1995			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	13	1,980	$12,300	$6.23	16	2,080	$8,860	$4.25
Dolomite	2	W	W	2.66	2	W	W	2.65
Sandstone	5	W	W	5.07 r/	3	W	W	5.46
Volcanic cinder and scoria	3	4	4	1.00	--	--	--	--
Total	XX	4,540	19,800	4.37 r/	XX	4,140	14,800	3.58

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes limestone-dolomite, reported with no distinction between the two.

TABLE 4
UTAH: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate and concrete products 2/	4,440	$17,000	$3.84
Asphaltic concrete aggregates and other bituminous mixtures	2,590	12,900	4.98
Road base and coverings 3/	6,960	19,400	2.79
Fill	3,050	4,280	1.40
Snow and ice control	34	82	2.41
Other	191	1,020	5.36
Unspecified: 4/			
Actual	2,600	8,810	3.38
Estimated	3,910	16,700	4.27
Total or average	23,800	80,200	3.38

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement and lime).

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
UTAH: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified within all districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	1,420	6,350	2,830	9,770	188	930	--	--
Asphaltic concrete aggregates and road base materials	663	4,060	1,350	6,260	187	1,190	385	1,390
Road base and coverings 3/	1,920	5,610	3,760	9,840	890	2,820	399	1,150
Fill	219	319	2,630	3,700	201	270	--	--
Snow and ice control	24	51	10	31	--	--	--	--
Other miscellaneous uses 4/	31	298	49	178	112	547	--	--
Unspecified: 5/								
Actual	2	4	2,570	8,720	29	80	--	--
Estimated	581	2,130	2,440	8,240	888	6,310	--	--
Total	4,860	18,800	15,600	46,700	2,490	12,100	784	2,540

1/ Data are rounded to three significant digits; may not add to totals shown.

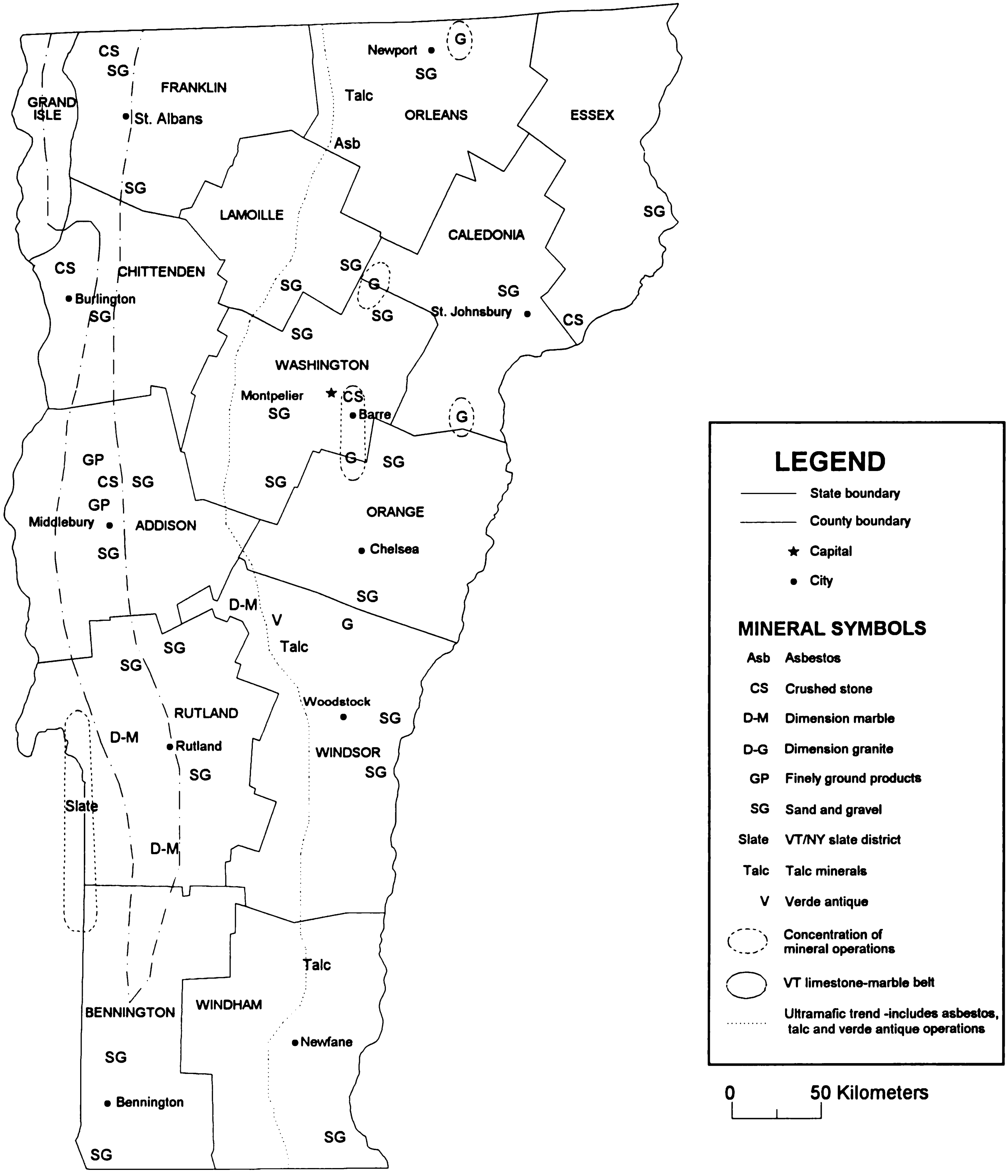
2/ Includes plaster and gunite sands.

3/ Includes fill and road and other stabilization (lime).

4/ Includes railroad ballast and snow and ice control.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

VERMONT



Source: Vermont Geological Survey, Office of the State Geologist/U.S. Geological Survey

THE MINERAL INDUSTRY OF VERMONT

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Vermont Geological Survey, Office of the State Geologist for collecting information on all nonfuel minerals.

In 1996, for the third consecutive year, Vermont ranked 46th among the 50 States in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $67 million, about an 11% increase from that of 1995. This followed a more than 18% increase from 1993 to 1994 and a 3% decrease from 1994 to 1995 (based on revised, final 1994 and final 1995 data). The State accounted for somewhat less than 0.5% of the U.S. total nonfuel mineral production value. Compared with 1995, the mineral commodity values that increased in 1996 were those of construction sand and gravel and dimension stone, while crushed stone and talc values showed small decreases. Talc production and value are not included in table 1 because the data have been withheld to protect company proprietary data. Compared with USGS estimates of the quantities produced in the 50 States during 1996, Vermont decreased in rank from third to fourth in talc and from fourth to fifth in dimension stone.

According to the Vermont Geological Survey,[2] construction sand and gravel value increased by nearly $5 million and dimension stone by $2.3 million. No new quarries were opened during the year, and there was no active mineral exploration reported in the State. However, there was some activity in the State's talc industry. Luzenac America Inc., the owner of all talc operations in Vermont, reported that the expansion of its Argonaut Mine in Ludlow was proceeding as planned. In 1996, the company's business had increased. Luzenac America had begun this project in 1994 in order to gain access to more and to make more efficient use of the ore body.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. Construction sand and gravel and crushed stone estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Marjorie Gale, Information and Education Specialist at the Vermont Geological Survey, submitted the information provided by that agency.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN VERMONT 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1994		1995		1996 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
Asbestos	metric tons	1,130	920	--	--	--	--
Gemstones		NA	1	NA	1	NA	1
Sand and gravel (construction)		3,890	14,500	3,220	11,000	4,200	15,800
Stone:							
Crushed		4,170	23,700	4,420	20,700	4,200	20,000
Dimension	metric tons	78,900	23,200	100,000	28,700	107,000	31,000
Total 3/		XX	62,300	XX	60,400	XX	66,800

p/ Reliminary. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Partial total; excludes values that must be concealed to avoid disclosing company proprietary data.

TABLE 2
VERMONT: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch): Other coarse aggregate 3/	24	$192	$8.00
Coarse aggregate, graded: Other graded coarse aggregate 4/	375	3,390	9.04
Coarse and fine aggregates:			
Graded road base or subbase	176	1,350	7.66
Other construction materials 5/	383	2,350	6.14
Agricultural: Other agricultural uses	145	620	4.28
Unspecified: 6/			
Actual	638	2,460	3.85
Estimated	2,680	10,300	3.85
Total	4,420	20,700	4.68

1/ Includes dolomite, granite, limestone, marble, quartzite, and slate.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone and riprap and jetty stone.

4/ Includes bituminous aggregate (coarse), concrete aggregate (coarse), and railroad ballast.

5/ Includes graded road base or subbase, stone sand (bituminous mix or seal), and stone sand (concrete)

6/ Includes production reported without a breakdown by use and estimates for nonrespondents.

TABLE 3
VERMONT: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994				1995			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	9 r/	2,260 r/	$12,800 r/	$5.68 r/	7	2,220	$8,380	$3.77
Dolomite	4	234	1,220	5.22	6	W	W	5.38
Marble	5	839	4,730	5.63	2	W	W	3.90
Granite	2 r/	W	W	7.78 r/	2	48	W	W
Quartzite	2	W	W	5.37	2	W	W	W
Slate	1	W	W	9.45	1	W	W	9.61
Total	XX	4,170	23,700	5.68	XX	4,420	20,700	4.68

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 4
VERMONT: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand) 2/	393	$1,750	$4.45
Asphaltic concrete aggregates and other bituminous mixtures	151	680	4.50
Road base and coverings 3/	991	2,970	3.00
Fill	243	676	2.78
Snow and ice control	220	581	2.64
Other 4/	106	441	4.16
Unspecified: 5/			
Actual	326	1,570	4.80
Estimated	787	2,360	3.00
Total or average	3,220	11,000	3.43

1/ Data are rounded to three significant digits; may not add to totals shown.

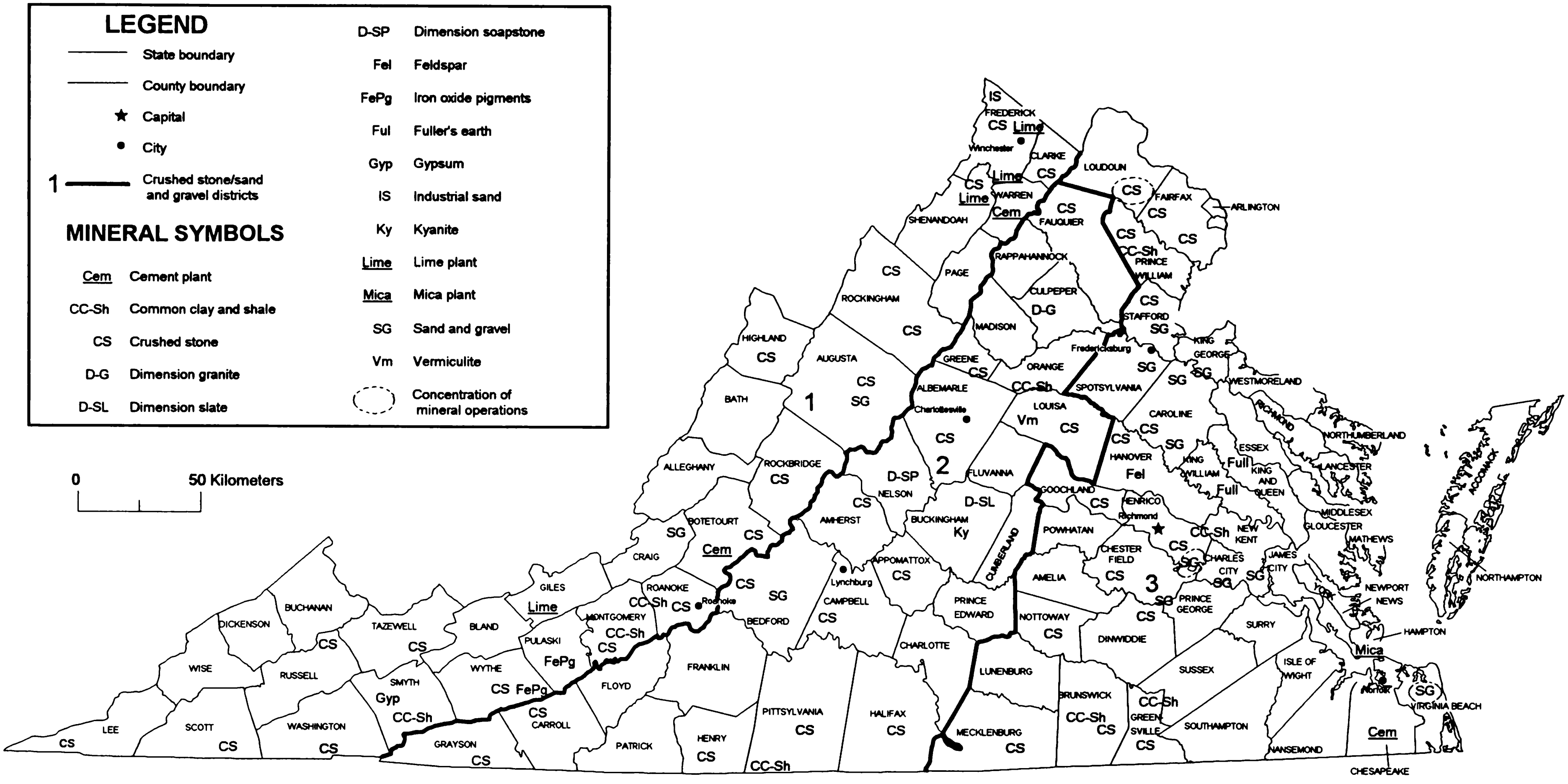
2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement).

4/ Includes filtration and railroad ballast.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

VIRGINIA



Source: Virginia Division of Mineral Resources/U.S. Geological Survey

THE MINERAL INDUSTRY OF VIRGINIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Virginia Division of Mineral Resources for collecting information on all nonfuel minerals.

Virginia climbed in rank from 25th to 22d among the 50 States in total nonfuel mineral production value[1] in 1996, according to the U.S. Geological Survey (USGS). The estimated value for 1996 was almost $529 million, a nearly 3% increase from that of 1995. This followed a 2.6% increase in 1995 from 1994 (based on final 1995 data). In 1996, the State accounted for about 1.5% of the U.S. total nonfuel mineral production value.

Virginia mines almost exclusively produce industrial minerals and coal. The last significant metal production occurred in 1981 when the State's only consistently active metal mine, an underground zinc operation, closed down because of the recession and a depressed metal market. While a diverse variety of minerals were produced in 1996 in Virginia, crushed stone accounted for 64% of the State's nonfuel mineral value. In 1996, the value of crushed stone increased by about $13 million, the most of any nonfuel mineral in Virginia for the year. From 1990 through 1996, Virginia produced more than 360 million metric tons of crushed stone, or an average of 51.6 million metric tons per year. Compared with 1995, most nonfuel mineral commodities increased in value. Portland cement, kyanite, common clays, vermiculite, and gemstone values all decreased by small amounts.

Based on USGS estimates of quantities produced in the 50 States during 1996, Virginia remained the only State to mine kyanite, second in the production of feldspar, second of two States that produce vermiculite, fourth in iron oxide pigments, and ninth in crushed stone. The State dropped in rank from eighth to ninth in the production of lime. While the only producing kyanite mine in the United States was in Virginia, mullite, a calcined kyanite, was synthetically produced in three other States. About 90% of U.S. kyanite and mullite output is used in refractories for the smelting and processing of a variety of metals and in glass and high-temperature ceramics manufacturing. Additionally, significant quantities of construction and industrial sand and gravel, masonry cement, and common clays were produced in the State.

The following narrative information was provided by the Virginia Division of Mineral Resources (VDMR).[2] Several companies conducted reconnaissance geologic, geochemical, and geophysical investigations for base and precious metals in the central Piedmont province of Virginia. Gold Crown Mining Co. continued to permit and intermittently work the old Kentuck Mine, east of Danville, Pittsylvania County, for small amounts of gold; and Southern Piedmont Mining continued to permit the old Moss gold mine in Goochland County. JLJ Enterprises was not active in processing any ore during the year from its permitted site near the Goochland County-Fluvanna County line.

During the early spring of 1996, the Harris Group purchased U.S. Silica Co., including the Montpelier operation in Hanover County, north of Richmond, which quarried and processed glass-grade feldspar.

During the spring, Golden Cat, a Division of Ralston Purina Co., began construction of a cat box filler manufacturing plant, about 40 kilometers northeast of Richmond, in King William County. The plant and other related costs for the Virginia facility were estimated to total up to $25 million. Increased tax revenues for the county were anticipated to be about $50,000 per year and up, and the new plant will hire about 70 people. The company plans to begin producing cat litter box filler products in July 1997.

In August, Cyprus Foote Mineral Co. shut down its lithium hydroxide plant at Sunbright, Scott County, in the southwestern part of the Commonwealth in deference to producing all of its lithium-carbonate at its new facility in Silver Peak, NV.

In November, U.S. Gypsum Co. announced that it will be closing its wallboard plant in Plasterco, VA (near Saltville) as well as its slope-entry underground gypsum mine in adjacent Smyth County in May 1999. The company will build a modern $110-million plant in Bridgeport, AL, which will open soon after the Virginia operation (which has been in operation for 75 years) closes.

At the end of the year, RGC (USA Minerals) was constructing a plant southwest of Stony Creek, in Sussex County, to mine heavy-mineral sand in adjacent Dinwiddie County. The company will invest about $20 million in preparation of its plant and open pit mine; water will be pumped from the Nottoway River, about 3 kilometers away, to the plant.

Cedar Mountain Stone continued to operate two crushed stone operations—its granite quarry in Louisa County, as well as a diabase quarry, near Mitchells in Culpeper County. The company has stripped a site just west of State Road 615 and opened up a dimension stone quarry; in the early fall, Cedar Mountain began sending blocks of granite, by truck, to a finishing plant in Georgia.

The VDMR continued geologic mapping in several counties at a detailed 1:24,000 scale and continued to compile and digitize 1:100,000-scale maps. The agency also continued field studies and compilation of identified mineral resources on 1:24,000-scale maps, the statewide carbonate project, the epithermal hot springs study, the coalbed methane resources study, and oil and gas studies of Dickenson County and Russell County. Completed during 1996 were a study on diamonds in Virginia; the Wise County oil and gas study; and a statistics report on the 1995 production of coal, oil and gas, and industrial and metallic mineral resources in Virginia. Published during the year were a study on the geology and mineral resources of Henry County and the City of Martinsville; a composite Devonian and Lower Mississippian geologic cross section near Norton, VA; a structural geologic cross section across the Atlantic Coastal plain; a 1:100,000-scale geologic map of Clarke, Frederick, Page, Shenandoah, and Warren Counties; and a statistics report on coal, oil and gas, and industrial and metallic mineral resources produced in the Commonwealth during 1994.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Palmer Sweet, Head Geologist with theVDMR, authored the text of mineral industry information submitted by that agency.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN VIRGINIA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement (portland)	930	54,700	W	W	W	W
Clays	870 3/	3,250 3/	891	3,200 3/	912	2,890 3/
Gemstones	NA	W	NA	W	NA	11
Lime	742	40,200	731	41,900	748	42,800
Sand and gravel (construction)	8,060	33,400	9,710	42,300	10,100	44,900
Stone:						
Crushed	56,700	327,000	55,400	326,000	57,000	339,000
Dimension metric tons	108 4/	13 4/	W	W	W	W
Combine value of cement, clays (fuller's earth), feldspar, gypsum (crude), iron oxide pigments (crude), kyanite, sand and gravel (industrial), stone [dimension dolomite, slate, and traprock (1995-96), dimension granite and slate (1994)], talc and pyrophyllite (1994, 1996), vermiculite, and values indicated by symbol W	XX	43,600	XX	101,000	XX	98,900
Total	XX	502,000	XX	515,000	XX	529,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.
1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/ Data are rounded to three significant digits; may not add to totals shown.
3/ Excludes certain clays; kind and value included with "Combined value" data.
4/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
VIRGINIA: CRUSHED STONE1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	360	$1,410	$3.92
Riprap and jetty stone	923	6,870	7.45
Filter stone	796	4,850	6.09
Other coarse aggregate	448	2,400	5.35
Coarse aggregate, graded:			
Concrete aggregate, coarse	5,870	35,900	6.11
Bituminous aggregate, coarse	2,360	15,200	6.44
Bituminous surface-treatment aggregate	1,160	7,960	6.86
Railroad ballast	290	1,940	6.69
Other graded coarse aggregate	1,400	10,000	7.16
Fine aggregate (-3/8 inch):			
Stone sand, concrete	664	4,450	6.70
Stone sand, bituminous mix or seal	910	5,930	6.52
Screening, undesignated	1,940	11,000	5.66
Coarse and fine aggregates:			
Graded road base or subbase	9,340	48,200	5.16
Unpaved road surfacing	1,130	6,340	5.61
Crusher run or fill or waste	1,750	8,360	4.78
Other construction materials 3/	2,680	18,800	7.01
Agricultural:			
Agricultural limestone	729	10,400	14.25
Poultry grit and mineral food	107	1,090	10.20
Other agricultural uses	(4/)	(4/)	11.43
Chemical and metallurgical:			
Cement manufacture	(4/)	(4/)	3.32
Lime manufacture	715	3,690	5.16
Flux stone	(4/)	(4/)	2.14
Chemical stone	(4/)	(4/)	11.02
Glass manufacture	305	3,110	10.21
Sulfur oxide removal	(4/)	(4/)	7.28
Special:			
Mine dusting or acid water treatment	183	4,160	22.72
Asphalt fillers or extenders	220	1,280	5.82
Whiting or whiting substitute	(4/)	(4/)	34.19
Other fillers or extenders	72	1,110	15.35
Other specified uses not listed	1,590	7,240	4.56
Unspecified: 5/			
Actual	17,400	95,200	5.48
Estimated	2,060	9,430	4.58
Total	55,400	326,000	5.89

1/ Includes dolomite, granite, limestone, miscellaneous stone, sandstone and quartzite, slate, and traprock.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes lightweight aggregate (slate), waste material, and other coarse and fine aggregate.

4/ Withheld to avoid disclosing company proprietary data; included with "Other specified uses not listed."

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
VIRGINIA: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	42	16,300	$89,800	$5.51	42	15,800	$89,600	$5.69
Dolomite	10	3,650	27,800	7.61	10	3,650	28,100	7.71
Granite	32 r/	22,800 r/	130,000 r/	5.73 r/	32	21,100	119,000	5.64
Traprock	9 r/	12,100 r/	68,900 r/	5.68 r/	10	12,600	73,200	5.84
Sandstone and quartzite	7	1,330	7,460	5.60	7	1,390	7,310	5.27
Slate	1	W	W	2.80	2	W	W	W
Miscellaneous stone	2	W	W	6.08	2	W	W	W
Total	XX	56,700	327,000	5.77	XX	55,400	326,000	5.89

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes limestone-dolomite, reported with no distinction between the two.

TABLE 4
VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 2/	1,100	5,840	W	W	W	W
Coarse aggregate, graded 3/	2,600	15,200	1,840	12,600	6,640	43,200
Fine aggregate (-3/8 inch) 4/	1,170	7,550	558	3,390	1,790	10,400
Coarse and fine aggregate 5/	3,250	15,700	W	W	W	W
Other construction materials 6/	(7/)	(7/)	2,690	18,000	10,400	57,700
Agricultural 8/	(9/)	(9/)	(9/)	(9/)	(9/)	(9/)
Chemical and metallurgical 10/	2,560	12,700	(9/)	(9/)	(9/)	(9/)
Special 11/	(9/)	(9/)	(9/)	(9/)	--	--
Unspecified: 12/						
Actual	4,220	23,800	2,410	14,300	10,700	57,100
Estimated	1,550	6,480	507	2,960	--	--
Total	17,600	105,000	8,180	52,900	29,600	168,000

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), and screening (undesignated).

5/ Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

6/ Includes lightweight aggregate (slate) and waste materials.

7/ Less than 1/2 unit.

8/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

9/ Withheld to avoid disclosing company proprietary data; included in "Total."

10/ Includes cement manufacture, chemical stone for alkali works, flux stone, glass manufacture, lime manufacture, and sulfur oxide removal.

11/ Includes asphalt fillers or extenders, mine dusting or acid water treatment, other fillers or extenders, whiting or whiting substitute, and other specified uses not listed.

12/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
VIRGINIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	1,860	$10,500	$5.65
Concrete products (blocks, bricks, pipe, decorative, etc.)	213	1,420	6.69
Asphaltic concrete aggregates and other bituminous mixtures	611	2,710	4.44
Road base and coverings	606	1,740	2.87
Fill	1,320	3,220	2.44
Snow and ice control	38	155	4.08
Other	120	558	4.65
Unspecified: 2/			
Actual	3,850	18,200	4.73
Estimated	1,100	3,810	3.47
Total or average	9,710	42,300	4.36

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
VIRGINIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products	W	W	W	W	1,660	9,220
Asphaltic concrete aggregates and road base materials 2/	207	1,190	127	521	2,200	5,960
Snow and ice control	W	W	W	W	25	101
Other miscellaneous uses	400	2,660	23	110	115	533
Unspecified: 3/						
Actual	24	110	1	5	3,820	18,100
Estimated	239	992	49	173	809	2,640
Total	870	4,950	200	808	8,640	36,500

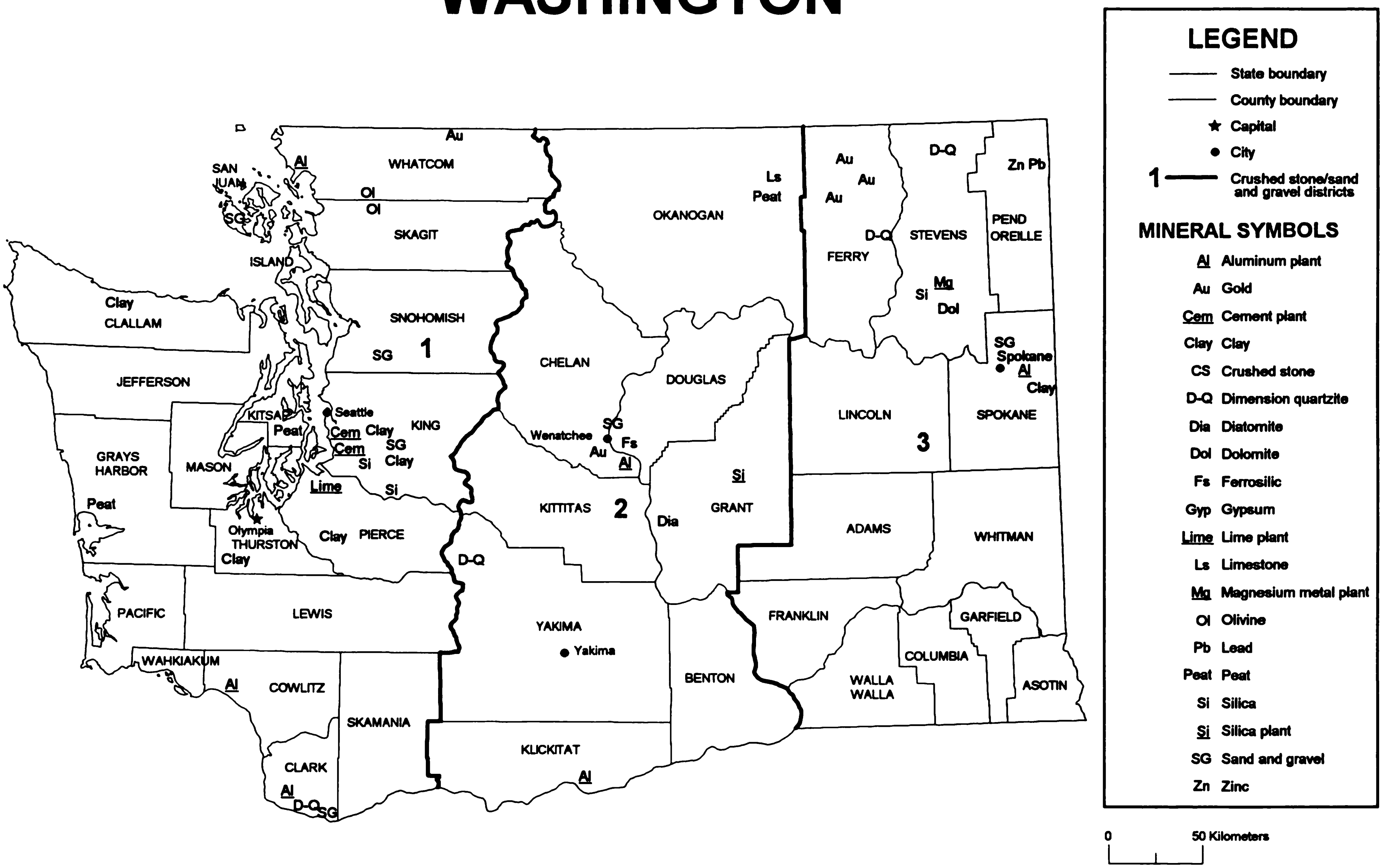
W Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes fill.

3/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

WASHINGTON



Source: Washington State Division of Geology and Earth Resources/U.S. Geological Survey

THE MINERAL INDUSTRY OF WASHINGTON

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Washington State Division of Geology and Earth Resources for collecting information on all nonfuel minerals.

In 1996, Washington rose in rank from 21st to 20th in the Nation in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $626 million, a more than 7% increase from that of 1995. This followed a 1% increase from 1994 to 1995 (based on final 1995 data). The State accounted for more than 1.5% of the U.S. total nonfuel mineral production value.

Gold and magnesium metal, the only metals to be produced from Washington's natural resources, represented nearly one-third of the State's nonfuel mineral value. About 62% of the remaining value came from construction sand and gravel, portland cement, and crushed stone. The State's increased nonfuel mineral value in 1996 resulted mainly from estimated increases in three nonfuel minerals: construction sand and gravel was up $28 million; magnesium metal, $10 million; and crushed stone, about $9 million. Relative to these increases, other value changes were small. Lime, olivine, common clays, natural gemstone, peat, and dimension stone values increased in 1996; while those of portland cement, gold, diatomite, industrial sand and gravel, and masonry cement decreased. In 1995, gold production decreased by a significant amount, the result of the shutdown of Asamera Minerals Inc.'s Cannon Mine at Wenatchee in December 1994 and Hecla Mining Co.'s gold and silver Republic unit in January 1995. But the State's drop in gold value plus a moderate decrease in the value of construction sand and gravel in 1995 were more than offset by substantial increases in magnesium metal and portland cement values.

Based on USGS estimates of the quantities produced in the 50 States in 1996, Washington climbed from fourth to third in diatomite production. The State remained 2d of the three States that produce magnesium metal, 6th in construction sand and gravel, and 10th in the production of gold. Approximately the same quantity of olivine was mined and processed in Washington as was in North Carolina, the only other State that produced the mineral. Additionally, significant quantities of portland cement and crushed stone were produced in the State. In 1996, Washington continued to lead the Nation in the production of primary aluminum with an estimated 1.11 million metric tons,[2] a nearly 13% increase from that of 1995. The State accounted for about 31% of the U.S. total primary aluminum production. Raw steel was also produced in the State, both metals being processed from materials received from foreign and other domestic sources.

The following narrative information was provided by the Washington State Division of Geology and Earth Resources[3] (DGER). Production data in the following text are those reported by the DGER, based on its own surveys and estimates. They differ from some production figures reported to the USGS. As was the case in 1995, Echo Bay Minerals Co. operated the only major gold mine in the State in 1996, the Kettle River Mine in the Republic district, Ferry County. According to the DGER, Echo Bay milled about 544,000 tons of ore and recovered 3,885 kilograms of gold. The company's ore came from the Lamefoot deposit (about 87%), from the K-2 deposit (10%), and the remainder from stockpiled ore of the Overlook deposit, which was mined out in 1995.

In mid-February, Santa Fe Pacific Gold Corp. completed an extensive drilling program and exercised its option to purchase the Golden Eagle gold deposit at Republic from Hecla Mining Co. Santa Fe, however, has put on hold any decision to develop the property.

An Environmental Impact Statement for Battle Mountain Gold Co.'s Crown Jewel gold deposit at Chesaw was scheduled to be released in February 1997. The company planned to complete permit applications for the operation during 1997. This process is expected to take about 1 year.

Cominco American Inc., through its parent company Cominco Ltd., acquired the Pend Oreille Mine in the northeast corner of the State. The company assisted in an extensive, ongoing surface and underground exploration program with hopes of identifying additional reserves of zinc and lead ore to justify a production decision.

A significant portion of the planned reclamation occurred at the Cannon gold mine of Asamera Minerals (U.S.) Inc. in Wenatchee and at the Key West gold mine (Republic district) of Echo Bay Minerals Co. Asamera proceeded with reclamation of the Cannon mill site in 1996. The mill had been sold, dismantled, and moved for use at another mine location in 1995. The mine workings were backfilled to eliminate access and minimize subsidence, after which the portal was sealed and underground mine reclamation was complete. The mill area, stockpile sites, borrow pits, and exploration roads were recontoured to appear more natural; and revegetation of the project area was commenced. The tailings impoundment area had been allowed to dry during much of

1996 so that equipment could gain access. Reclamation consisted of first covering the impoundment with a woven polypropylene geotextile to stabilize the soft tailings and allow laying of a permeable gravelly sand layer at least 0.76 meters thick directly on top of the geotextile. This was covered by 0.6 meters of silty, clay-like material that provides a growth medium for vegetation. Wetlands were constructed below the tailings impoundment.

The recontouring of the Key West Mine waste rock dumps was completed. Wetlands constructed below the Key West pit enhance wildlife habitat and can accommodate water that may overflow the pit lake. Most of the site has been revegetated with grasses and a variety of evergreen trees.

Surface mining laws were modified in 1996. Legislation now allows miners to have what is termed a "technical assistance" visit before enforcement actions are taken by agencies. Regulatory reform also allows industry to request what is referred to as a "coordinated permit" process to establish a timeline for permit issuance.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] All tons are metric unless otherwise specified.

[3] Robert E. Derkey, Geologist, authored the text of mineral industry information submitted by the Washington State Division of Geology and Earth Resources.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WASHINGTON 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

	1994		1995		1996 p/	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays	246 3/	1,140 3/	220	1,040	234	1,160
Gemstones	NA	1,050	NA	53	NA	W
Gold 4/ kilograms	7,410	91,800	W	W	W	W
Lime	239	W	W	W	W	W
Peat	3	111	2 5/	87 5/	W	W
Sand and gravel (construction)	39,600	165,000	37,700	155,000	41,500	183,000
Stone (crushed)	14,700	91,900	15,800 6/	76,800 6/	15,200 6/	85,900 6/
Combined value of cement, clays [fire (1994)], diatomite, magnesium metal, olivine, sand and gravel (industrial), silver (1994), stone [crushed dolomite, limestone and marble (1995-96), dimension miscellaneous],and values indicated by symbol W	XX	225,000	XX	350,000	XX	356,000
Total	XX	576,000	XX	582,000	XX	626,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value" data.

4/ Recoverable content of ores, etc.

5/ Data series changed to production beginning in 1995; prior years shipment data may not be comparable.

6/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
WASHINGTON: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	W	W	$7.10
Riprap and jetty stone	368	$2,320	6.29
Filter stone	W	W	2.47
Other coarse aggregate	W	W	7.50
Coarse aggregate, graded:			
Concrete aggregate, coarse	18	75	4.17
Bituminous aggregate, coarse	170	686	4.04
Bituminous surface-treatment aggregate	39	206	5.28
Railroad ballast	140	801	5.72
Fine aggregate (-3/8 inch):			
Stone sand, concrete	18	75	4.17
Stone sand, bituminous mix or seal	109	426	3.91
Screening, undesignated	132	547	4.14
Coarse and fine aggregates:			
Graded road base or subbase	2,910	13,000	4.47
Unpaved road surfacing	1,050	2,510	2.40
Terrazzo and exposed aggregate	124	975	7.86
Crusher run or fill or waste	352	1,760	4.99
Other coarse and fine aggregates	36	148	4.11
Other construction materials	146	860	5.89
Agricultural: Agricultural limestone	7	138	19.71
Chemical and metallurgical:			
Cement manufacture	809	4,040	5.00
Flux stone	40	536	13.40
Special:			
Asphalt fillers or extenders	3	10	3.33
Whiting or whiting substitute	(3/)	(3/)	113.00
Other fillers or extenders	(3/)	(3/)	73.47
Other miscellaneous uses: Paper manufacture	(3/)	(3/)	193.13
Unspecified: 4/			
Actual	3,570	12,700	3.57
Estimated	5,720	21,700	3.79
Total	15,800	76,800	4.85

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Includes dolomite, granite, limestone, miscellaneous stone, sandstone, traprock, and volcanic cinder and scoria; excludes limestone-dolomite from State total to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
WASHINGTON: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	10 2/	2,140 2/	$23,600 2/	$11.01 r/ 2/	7 3/	1,220 3/	$19,200 3/	$15.77 3/
Dolomite	4	281	1,120	3.99	5	W	W	W
Marble	2	W	W	W	(4/)	(4/)	(4/)	(4/)
Granite	11	234	1,030	4.38	9	270	1,100	4.08
Traprock	116 r/	10,600 r/	47,700 r/	4.48	133	12,100	47,000	3.88
Sandstone	4	W	W	W	5	W	W	W
Volcanic cinder and scoria	3	W	W	9.02	3	207	1,190	5.77
Miscellaneous stone	8	475	2,560	5.40	13	802	3,440	4.28
Total	XX	14,700 r/	91,900 r/	6.24 r/	XX	15,800	76,800	4.85

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes limestone-dolomite, reported with no distinction between the two.

3/ Excludes limestone-dolomite from State total to avoid disclosing company proprietary data.

4/ Excludes marble from State total to avoid disclosing company proprietary data.

TABLE 4
WASHINGTON: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		Unspecified within all districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 3/	441	2,850	W	W	W	W	--	--
Coarse aggregate, graded 4/	157	876	W	W	W	W	--	--
Fine aggregate (-3/8 inch) 5/	185	757	74	291	--	--	--	--
Coarse and fine aggregate 6/	3,950	15,800	306	1,620	216	974	--	--
Other construction materials	37	266	85	267	159	682	--	--
Agricultural 7/	--	--	(8/)	(8/)	(8/)	(8/)	--	--
Chemical and metallurgical 9/	809	4,040	--	--	40	536	--	--
Special 10/	--	--	(8/)	(8/)	(8/)	(8/)	--	--
Other miscellaneous uses 11/	--	--	(8/)	(8/)	--	--	--	--
Unspecified: 12/								
Actual	1,580	6,520	490	1,370	1,300	3,670	195	1,170
Estimated	4,480	17,000	184	755	1,050	3,920	--	--
Total	11,600	48,100	1,220	17,600	2,780	9,930	195	1,170

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Excludes limestone-dolomite and marble from State total to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, and railroad ballast.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), and screening (undesignated).

6/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

7/ Includes agricultural limestone.

8/ Withheld to avoid disclosing company proprietary data; included in "Total."

9/ Includes cement manufacture and flux stone.

10/ Includes asphalt fillers or extenders, other fillers or extenders, and whiting or whiting substitute.

11/ Includes paper manufacture.

12/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
WASHINGTON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	10,300	$49,200	$4.79
Plaster and gunite sands	255	983	3.85
Concrete products (blocks, bricks, pipe, decorative, etc.)	299	2,070	6.92
Asphaltic concrete aggregates and other bituminous mixtures	1,510	7,430	4.92
Road base and coverings 2/	7,140	31,200	4.37
Fill	6,130	16,800	2.74
Snow and ice control	138	595	4.31
Railroad ballast	77	506	6.57
Other 3/	818	2,370	2.90
Unspecified: 4/			
Actual	3,450	12,200	3.54
Estimated	7,640	31,400	4.11
Total or average	37,700	155,000	4.10

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Includes filtration.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
WASHINGTON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		Unspecified within all districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	7,580	42,700	1,110	4,090	2,140	5,380	2	9
Asphaltic bituminous mixtures	1,300	6,550	175	757	33	119	--	--
Road base and coverings 3/	5,730	26,200	756	3,000	647	1,970	--	--
Fill	5,990	16,300	32	98	9	64	99	374
Other miscellaneous uses 4/	895	3,010	104	315	34	151	--	--
Unspecified: 5/								
Actual	1,750	6,330	540	2,260	956	2,750	201	847
Estimated	5,850	25,000	1,560	5,560	229	807	--	--
Total	29,100	126,000	4,270	16,100	4,050	11,200	303	1,230

1/ Data are rounded to three significant digits; may not add to totals shown.

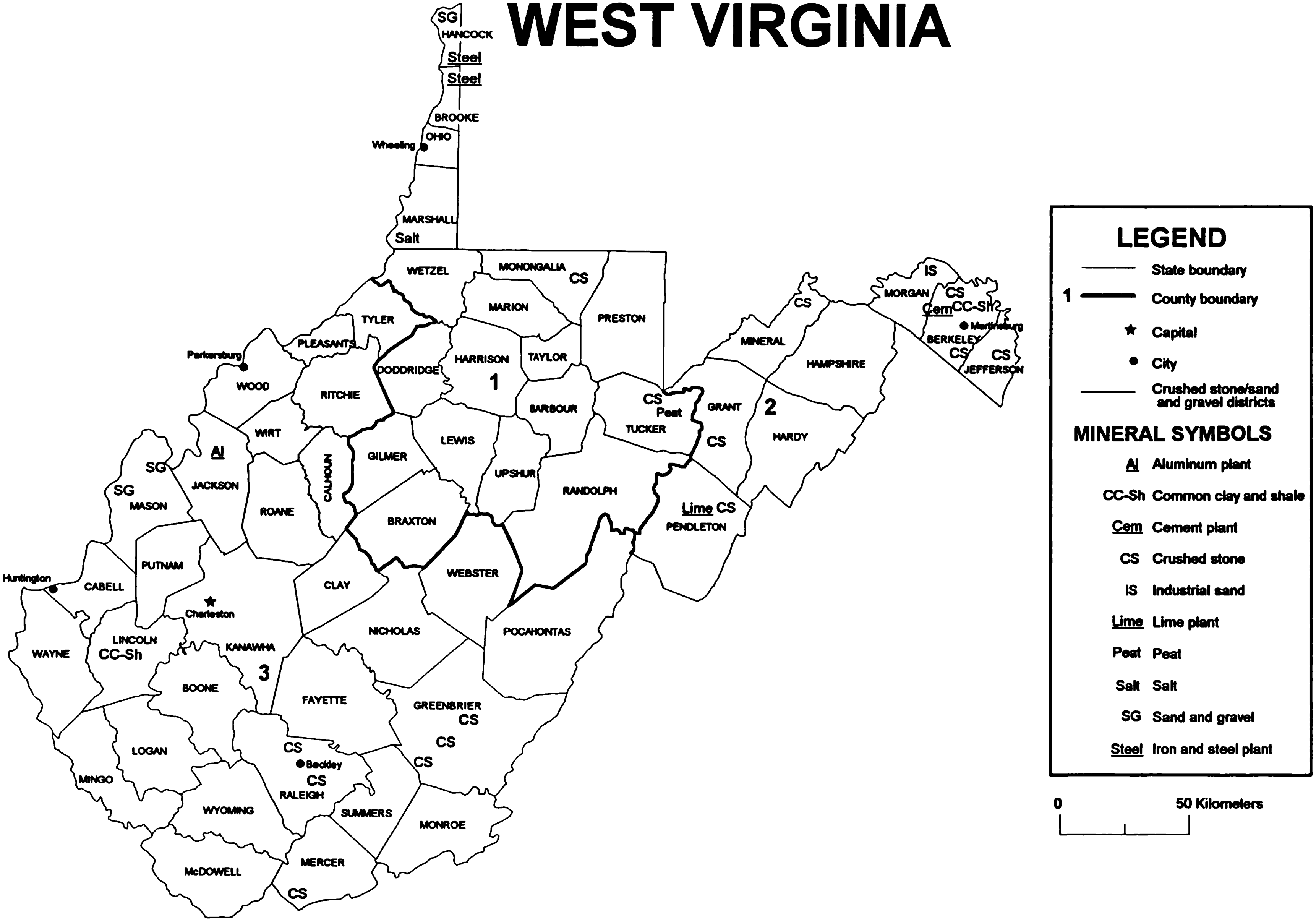
2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement).

4/ Includes filtration, railroad ballast, and snow and ice control.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

WEST VIRGINIA



Source: West Virginia Geological and Economic Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF WEST VIRGINIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the West Virginia Geological and Economic Survey for collecting information on all nonfuel minerals.

West Virginia ranked 40th among the 50 States in total nonfuel mineral production value[1] in 1996, according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $191 million, a 5.5% increase from that of 1995. The State accounted for 0.5% of the U.S. total nonfuel mineral production value. Crushed stone and portland cement, in descending order of value, were West Virginia's two leading nonfuel minerals. The rise in the State's nonfuel mineral value in 1996 resulted from increased crushed stone (including crushed dolomite) and lime values. Nonfuel minerals that decreased in value included portland cement, salt, construction sand and gravel, masonry cement, and common clays.

In 1995, there was virtually no net change in the State's total nonfuel mineral value from that of 1994 (based on final 1995 data), although there were distinct changes in various sectors of the industry *(see table 1)*. In 1995, a $24-million decrease in the value of crushed stone and a relatively small decrease in industrial sand and gravel were, for the most part, offset by a large increase in portland cement and smaller increases in construction sand and gravel, lime, and salt.

Based on USGS estimates of quantities produced in the 50 States in 1996, West Virginia rose in rank from 10th to 9th in salt. Additionally, significant quantities of cushed stone and industrial sand and gravel were produced in the State. West Virginia mines produced only industrial minerals and coal; no metals were mined in the State. Primary aluminum and raw steel were produced in the State, but both metals were processed from materials acquired from foreign and other domestic sources. West Virginia was 11th in the Nation in primary aluminum production in 1996.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WEST VIRGINIA 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays	138	291	184	365	167	306
Gemstones	NA	1	NA	1	NA	1
Sand and gravel (construction)	1,380	5,970	1,800	7,650	1,550	6,360
Stone (crushed) 3/	12,300	99,300	11,800	75,000 3/	13,000	81,900
Combined value of cement, lime, peat, salt, sand and gravel (industrial), and stone (crushed dolomite, dimension sandstone)	XX	75,500	XX	97,700	XX	102,000
Total	XX	181,000	XX	181,000	XX	191,000

p/ Preliminary. NA Not available. XX Not applicable.
1/ Production as measured by mine shipments or marketable production (including consumption by producers).
2/ Data are rounded to three significant digits; may not add to totals shown.
3/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
WEST VIRGINIA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	W	W	$6.52
Riprap and jetty stone	187	$1,230	6.60
Filter stone	64	475	7.42
Coarse aggregate, graded:			
Concrete aggregate, coarse	458	2,820	6.15
Bituminous aggregate, coarse	330	1,880	5.70
Bituminous surface-treatment aggregate	289	1,520	5.27
Railroad ballast	W	W	6.65
Other graded coarse aggregate	W	W	4.65
Fine aggregate (-3/8 inch):			
Stone sand, concrete	67	378	5.64
Stone sand, bituminous mix or seal	273	1,460	5.36
Screening, undesignated	102	563	5.52
Coarse and fine aggregates:			
Graded road base or subbase	842	4,940	5.87
Unpaved road surfacing	83	554	6.67
Crusher run or fill or waste	811	4,170	5.15
Other coarse and fine aggregates	W	W	4.10
Other construction materials 3/	400	2,380	5.95
Agricultural: Agricultural limestone	5	27	5.40
Chemical and metallurgical:			
Cement manufacture	(4/)	(4/)	4.27
Sulfur oxide removal	(4/)	(4/)	5.35
Unspecified: 5/			
Actual	4,410	33,200	7.52
Estimated	1,780	12,000	6.79
Total	11,800	75,000	6.38

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Includes limestone and sand stone; excludes dolomite from State total to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes pipe bedding.

4/ Withheld to avoid disclosing company proprietary data; included in "Total."

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
WEST VIRGINIA: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995 2/			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	28	10,200	$66,000	$6.48	38	10,800	$68,800	$6.36
Dolomite	1	(2/)	19,200	(2/)	--	--	--	--
Sandstone	13	2,070	14,100	6.79	10	934	6,170	6.61
Total	XX	12,300	99,300	8.10 r/	XX	11,800	75,000	6.38

r/ Revised. XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Excludes dolomite to avoid disclosing company proprietary data.

TABLE 4
WEST VIRGINIA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	49	331	W	W	W	W
Coarse aggregate, graded 4/	W	W	W	W	564	2,970
Fine aggregate (-3/8 inch) 5/	50	288	W	W	W	W
Coarse and fine aggregate 6/	W	W	W	W	914	4,970
Other construction materials 7/	862	4,840	842	5,320	626	3,660
Agricultural 8/	(9/)	(9/)	(9/)	(9/)	(9/)	(9/)
Chemical and metallurgical 10/	(9/)	(9/)	(9/)	(9/)	--	--
Unspecified: 11/						
Actual	3,250	24,400	(9/)	(9/)	(9/)	(9/)
Estimated	622	5,180	419	2,340	734	4,530
Total	4,980	36,600	3,280	18,300	3,510	20,100

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Excludes dolomite from State total to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone, macadam, and riprap and jetty stone.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), and screening (undesignated).

6/ Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregate.

7/ Includes pipe bedding.

8/ Includes agricultural limestone.

9/ Withheld to avoid disclosing company proprietary data; included in "Total."

10/ Includes cement manufacture and sulfur oxide removal.

11/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
WEST VIRGINIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

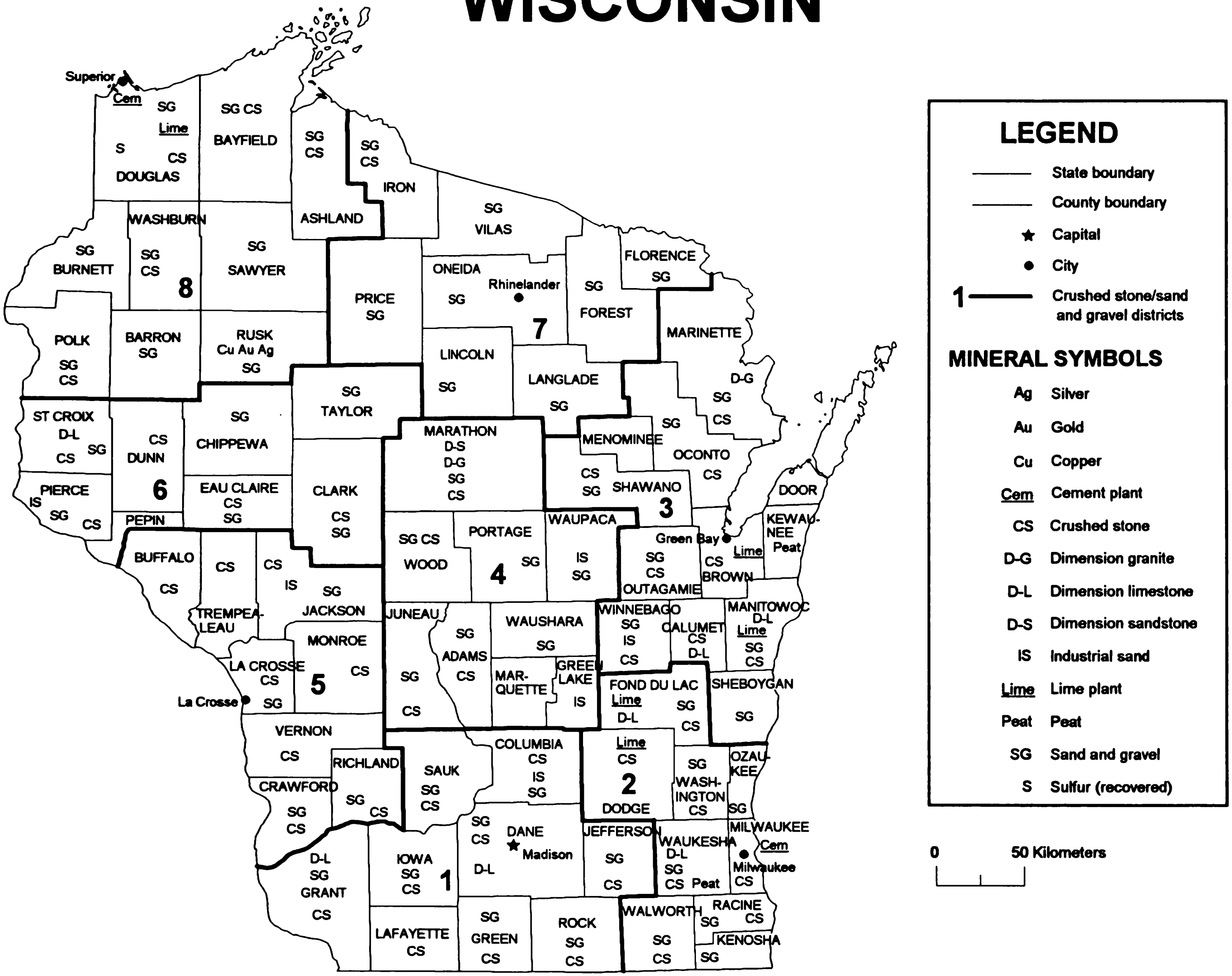
Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate and concrete products	652	$2,730	$4.19
Asphaltic concrete aggregates and road base materials 2/	240	865	3.60
Unspecified, 3/ actual	907	4,060	4.47
Total or average	1,800	7,650	4.25

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes fill and snow and ice control.

3/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

WISCONSIN



Source: Wisconsin Geological and Natural History Survey/U.S. Geological Survey

THE MINERAL INDUSTRY OF WISCONSIN

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Wisconsin Geological and Natural History Survey for collecting information on all nonfuel minerals.

In 1996, for the 2d consecutive year, Wisconsin ranked 33d among the 50 States in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The estimated value for 1996 was $399 million, a 4% decrease from that of 1995. This followed a 31% increase from 1993 to 1994 and a 1.7% increase from 1994 to 1995 (based on revised 1994 data and final 1995 data). The State accounted for more than 1% of the U.S. total nonfuel mineral production value.

Crushed stone and construction sand and gravel were, by value, Wisconsin's leading nonfuel minerals in 1996, each accounting for more than 26% of the State's total nonfuel mineral value. Copper was third; all Wisconsin metal mine production—copper, gold, and silver—together equaled about 27% of the State's total. In 1996, increases of more than $6 million in the value of gold and $3 million in construction sand and gravel offset, only in part, a substantial drop in the value of copper. Other nonfuel mineral commodity values that increased in 1996 included silver and peat, while those of crushed stone, lime, dimension stone, and gemstones showed a decrease. In 1995, increases in construction sand and gravel and lime values more than offset decreased values for crushed stone and gold, while copper's production value increased slightly for the year.

Compared with USGS estimates of quantities produced in the other 49 States for 1996, Wisconsin remained second of two States that produce silica stone, third in dimension stone, fifth in industrial sand and gravel, and ninth in construction sand and gravel. The State moved up from ninth to eighth in silver and dropped from fifth to sixth in copper production. Additionally, significant quantities of crushed stone and lime were produced in the State.

The following narrative information was provided by the Wisconsin Geological and Natural History Survey.[2] The Flambeau Mine (a small open pit copper-gold mine) continued to operate successfully, both in economic terms and environmentally. The review of Crandon Mining Co.'s (CMC) proposal for its underground zinc-copper mine, the Crandon Mine, continued with progress on development of local agreements with affected local governmental bodies and with the permitting assessments involving the Wisconsin Department of Natural Resources. The final release of the new nonmetallic mining reclamation rules was another highlight in 1996.

Flambeau Mining Co.'s open pit copper-gold operation near the city of Ladysmith in Rusk County continued to be Wisconsin's major producer of metallic mineral ore. During the year, production remained at near-peak levels of massive sulfide ore containing enriched levels of copper metal and minor quantities of gold and silver. According to the Wisconsin Department of Natural Resources, no environmental compliance problems were experienced during the year. Flambeau Mining Company paid in excess of $6 million in 1996 for the occupational tax levied on the net proceeds of Wisconsin metalliferous mining operations. This special tax payment was based on net proceeds of about $60 million and was paid in addition to all other corporate taxes required at both the Federal and State levels.

The CMC completed the development of the environmental impact report (EIR) for its proposed underground mine in Forest County; however, review of the EIR continued throughout the year. The ore deposit is a large zinc-copper-massive sulfide of about 50 million metric tons in size, with grades of zinc and copper averaging 5% and 1%, respectively, over the entire ore body. Minor quantities of lead, gold, and silver were also present and potentially recoverable. The focus of the ongoing review was on the ground water flow and contaminant transport models. All permit applications were received, and development of the draft Environmental Impact Statement (EIS) was initiated. The draft EIS was not expected until the spring of 1997.

Metallic mining projects in Wisconsin are required to comply with all local zoning and land use ordinances; local agreements are contract-based arrangements between potential mining applicants and local units of government designed to accomplish compliance and to address issues of local concern prior to initiation of mining. In 1996, CMC, a partnership between Exxon Minerals Co. and Rio Algom Ltd., signed agreements with the town of Nashville, the town of Lincoln, and Forest County.

Thirty-two drill holes were completed for the purposes of evaluating massive-sulfide targets in nine counties during the year. Three companies were involved in the exploration: (1) BHP Minerals International focused on targets in Lincoln and Florence Counties, as well as the Bishop Lake target in Forest County, west of the Crandon deposit, (2) Sharpe Energy and Resources Ltd. drilled two primary targets, one in Price County and the other the Bend deposit in Taylor County, and (3) Flambeau Mining Co. completed 13 holes on the Eisenbrey (formerly known as the Thornapple) deposit, as well as 8 other exploratory drill holes on at least three targets in their west-central Wisconsin exploration effort in Jackson, Clark, and Trempealeau Counties.

Statewide nonmetallic mining reclamation rules were extensively redrafted in 1996 following several hearings around the State during the previous year. Chapter NR 135 was mandated by the passage of 1993 Wisconsin Act 464 and established minimum standards for the reclamation of nonmetallic mining operations throughout the State. The department had postponed promulgation of NR 135 pending revisions to the proposed rule and potential statutory language modifications, as well as the appointment of an advisory group known as the Nonmetallic Mining Council. Formal action is expected in1997 on the proposed rules and statutory modifications.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Thomas Evans, Geologist with the WGNHS, authored the text of information submitted by that agency. James Robertson is the Director and State Geologist of the WGNHS.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WISCONSIN 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1994		1995		1996 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
Gemstones		NA	53	NA	65	NA	W
Lime		507	30,300	568	33,900	552	33,000
Peat		2	61	W	W	W	W
Sand and gravel:							
Construction		29,200	91,500	32,200	102,000	32,900	105,000
Industrial		1,630	32,400	1,670	33,300	1,670	33,300
Silica stone 3/	metric tons	45	80	W	W	W	W
Stone:							
Crushed		28,600	115,000 4/	26,000	108,000	25,000	106,000
Dimension	metric tons	125,000	14,100	128,000	14,500	143,000	14,400
Combined value of copper, gold, silver, stone [crushed quartzite (1994)], and values indicated by symbol W		XX	126,000	XX	124,000	XX	107,000
Total		XX	409,000	XX	416,000	XX	399,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

4/ Excludes certain stones; value included with "Combined value" data.

TABLE 2
WISCONSIN: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	122	$690	$5.66
Filter stone	148	655	4.43
Other coarse aggregate 3/	622	2,620	4.21
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,590	7,100	4.47
Bituminous aggregate, coarse	748	3,540	4.73
Bituminous surface-treatment aggregate	292	966	3.31
Other graded coarse aggregate 4/	82	298	3.63
Fine aggregate (-3/8 inch):			
Stone sand, concrete	31	123	3.97
Stone sand, bituminous mix or seal	31	125	4.03
Screening, undesignated	469	1,520	3.24
Coarse and fine aggregates:			
Graded road base or subbase	7,090	26,100	3.68
Unpaved road surfacing	1,030	2,230	2.16
Crusher run or fill or waste	420	1,380	3.28
Other construction materials 5/	536	2,950	5.50
Agricultural: Agricultural limestone	444	4,940	11.11
Chemical and metallurgical:			
Lime manufacture	(6/)	(6/)	3.98
Flux stone	31	152	4.90
Other specified uses not listed	(6/)	(6/)	3.36
Unspecified: 7/			
Actual	5,970	26,800	4.49
Estimated	6,120	25,000	4.09
Total	26,000	108,000	4.16

1/ Includes dolomite, granite, limestone, limestone-dolomite, sandstone and quartzite, and traprock.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes macadam.

4/ Includes railroad ballast.

5/ Includes roofing granules and terrazzo and exposed aggregate.

6/ Withheld to avoid disclosing company proprietary data; included in "Total."

7/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
WISCONSIN: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	203 r/	22,400 r/	$91,100 r/	$4.07	170	20,100	$84,300	$4.19
Dolomite	7	1,370 r/	5,620 r/	4.11 r/	3	1,110	4,790	4.30
Granite	9	1,200	2,340	1.96	9	1,210	3,110	2.58
Traprock	4	1,850	7,870	4.27	3	1,970	8,980	4.56
Sandstone and quartzite	4	1,770	7,660 3/	4.33 3/	3	1,560	6,800	4.35
Total	XX	28,600 r/	115,000 r/	4.01	XX	26,000	108,000	4.16

r/ Revised. XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes "limestone-dolomite," reported with no distinction between the two.

3/ Excludes quartzite from State total to avoid disclosing company proprietary data.

TABLE 4
WISCONSIN CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	23	75	W	W	W	W
Coarse aggregate, graded 4/	W	W	1,060	5,010	730	2,750
Fine aggregate (-3/8 inch) 5/	62	246	W	W	W	W
Coarse and fine aggregate 6/	W	W	2,020	7,460	2,830	10,200
Other construction materials 7/	3,350	14,600	853	3,610	370	1,120
Agricultural 8/	165	1,070	(9/)	(9/)	(9/)	(9/)
Chemical and metallurgical 10/	--	--	(9/)	(9/)	(9/)	(9/)
Other miscellaneous uses 11/	--	--	--	--	(9/)	(9/)
Unspecified: 12/						
Actual	561	2,600	781	3,680	68	279
Estimated	1,490	6,340	527	1,910	2,390	8,880
Total	5,650	24,900	5,450	25,000	6,600	24,100

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	W	W	76	552	6	34
Coarse aggregate, graded 4/	--	--	W	W	1	7
Fine aggregate (-3/8 inch) 5/	W	W	W	W	--	--
Coarse and fine aggregate 6/	1,090	1,840	W	W	72	314
Other construction materials 7/	19	62	663	2,450	--	--
Agricultural 8/	--	--	25	177	37	293
Chemical and metallurgical 10/	--	--	--	--	--	--
Other miscellaneous uses 11/	--	--	--	--	--	--
Unspecified: 12/						
Actual	1,340	5,650	2,310	10,500	911	4,140
Estimated	149	1,360	39	186	1,530	6,360
Total	2,600	8,910	3,110	13,900	2,560	11,100

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Production reported in District 8 was included with "District 6" to avoid disclosing company proprietary data; no crushed stone was produced in District 7.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), and screening (undesignated).

6/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and crusher run select material or fill).

7/ Includes roofing granules.

8/ Includes agricultural limestone.

9/ Withheld to avoid disclosing company proprietary data; included in "Total."

10/ Includes flux stone and lime manufacture.

11/ Includes other specified uses not listed.

12/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
WISCONSIN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	7,680	$28,100	$3.66
Plaster and gunite sands	25	159	6.36
Concrete products (blocks, bricks, pipe, decorative, etc.)	271	1,610	5.94
Asphaltic concrete aggregates and other bituminous mixtures	1,880	6,090	3.24
Road base and coverings 2/	5,630	15,100	2.68
Fill	1,420	2,370	1.67
Snow and ice control	199	761	3.82
Railroad ballast	4	16	4.00
Roofing granules	9	60	6.67
Filtration	8	60	7.50
Other	362	1,290	3.57
Unspecified: 3/			
Actual	8,680	27,300	3.14
Estimated	6,040	19,000	3.14
Total or average	32,200	102,000	3.16

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement and lime).

3/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
WISCONSIN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	1,450	4,930	3,370	12,400	1,510	5,420	W	W
Asphaltic bituminous mixtures	464	1,640	599	1,780	201	618	W	W
Road base and coverings 3/	205	564	2,700	7,740	966	2,180	155	481
Fill	140	288	582	841	237	588	303	379
Snow and ice control	26	57	82	372	10	84	W	W
Railroad ballast	--	--	--	--	--	--	--	--
Other miscellaneous uses 4/	121	523	36	132	--	--	193	1,020
Unspecified: 5/								
Actual	1,320	4,340	5,790	18,200	42	69	399	880
Estimated	577	1,790	1,360	4,300	935	2,380	413	1,240
Total	4,300	14,100	14,500	45,800	3,900	11,300	1,460	4,000
	District 5		District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	W	W	857	3,590	191	795	319	1,360
Asphaltic bituminous mixtures	W	W	215	577	71	190	263[6]	1,110[6]
Road base and coverings 3/	--	--	730	1,840	410	888	470	1,390
Fill	W	W	59	133	45	56	W	W
Snow and ice control	8	13	43	119	5	12	W	W
Railroad ballast	--	--	--	--	--	--	4	16
Other miscellaneous uses 4/	167	572	212	682	--	--	80	236
Unspecified: 5/								
Actual	214	685	--	--	52	147	867[6]	2,920[6]
Estimated	--	--	1,530	5,500	680	1,700	540	2,050
Total	388	1,270	3,640	12,400	1,450	3,790	2,540[6]	9,080[6]

W Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

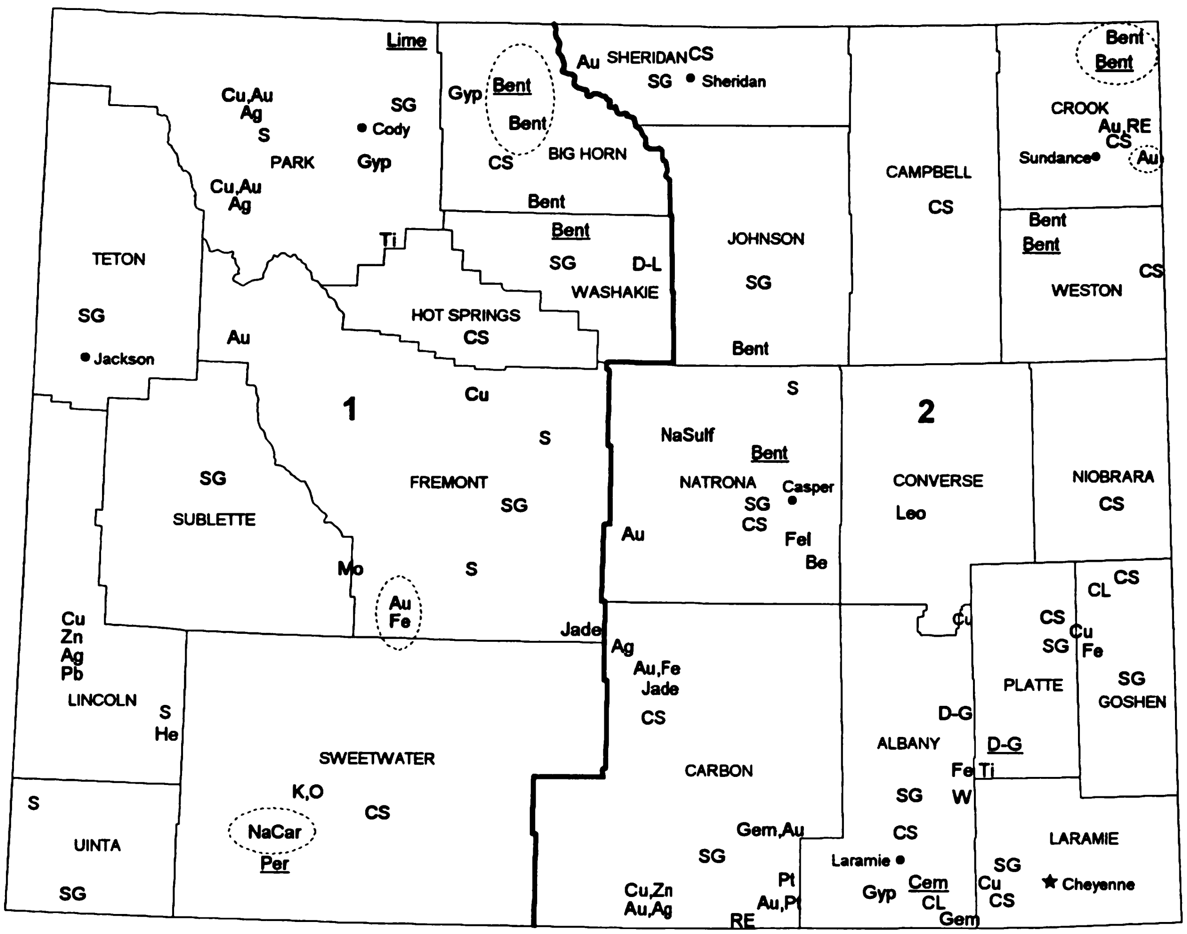
3/ Includes road and other stabilization (cement and lime).

4/ Includes filtration and roofing granules.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

6/ Includes unspecified within all districts.

WYOMING



Metals exploration activities are included on this map.

LEGEND

- State boundary
- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS

Ag	Silver
Au	Gold
Be	Beryllium
Bent	Bentonite
Bent	Bentonite mill
Cem	Cement plant
CL	Crushed limestone
CS	Crushed stone
Cu	Copper
D-G	Dimension granite
D-G	Dimension granite plant
D-L	Dimension limestone
Fe	Iron
Fel	Feldspar
Gem	Diamonds
Gyp	Gypsum
He	Helium
Jade	Jade
K	Potash
Leo	Leonardite
Lime	Lime plant
Mo	Molybdenum
NaCar	Sodium carbonate
NaSulf	Sodium sulfate
O	Olivine
Per	Perlite plant
Pt	Platinum group metals
Pb	Lead
RE	Rare earths
S	Sulfur
SG	Sand and gravel
Ti	Titanium
W	Tungsten
Zn	Zinc
◌	Concentration of mineral operations

0 100 Kilometers

Source: Geological Survey of Wyoming/U.S. Geological Survey

THE MINERAL INDUSTRY OF WYOMING

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Geological Survey of Wyoming for collecting information on all nonfuel minerals.

In 1996, Wyoming ranked 14th among the 50 States in total nonfuel mineral production value,[1] according to the U.S. Geological Survey (USGS). The State ranked 13th in 1995. The estimated value for 1996 was $918 million, a 5.7% decrease from that of 1995. This followed a 10.6% increase from 1994 to 1995 (based on final 1995 data). The State accounted for about 2.5% of the U.S. total nonfuel mineral production value.

Wyoming's leading nonfuel minerals, by value, are soda ash and bentonite clays. In 1996, bentonite moderately increased in value, whereas a substantial decrease in the value of soda ash accounted for the major portion of the State's overall decrease. Most of the remaining decrease resulted from drops in the values of portland cement and construction sand and gravel. Other nonfuel minerals that increased in value included Grade-A helium and lime, while a decrease occurred for crushed stone. In 1995, the State's increased value mostly resulted from a very substantial increase in soda ash and, relative to soda ash, a small increase in construction sand and gravel. Grade-A helium value showed a moderate decrease.

Compared with USGS estimates of the quantities produced in the other 49 States during 1996, Wyoming remained first in the production of soda ash and bentonite and second in Grade-A helium. Soda ash (sodium carbonate) is an inorganic chemical extensively used in the manufacture of glass, soap and detergents, paper, textiles, and as sodium bicarbonate in food products. The United States is the world's largest soda ash-producing nation. Wyoming, one of only two producing States, is home to the world's largest known natural deposit of trona, the principal ore from which soda ash is refined. California produces a significantly smaller quantity of natural soda ash. Wyoming has not had any significant metal production since iron ore mining ceased in April 1984. A small tonnage of hand-cobbed beryllium concentrate was produced in Fremont County in 1986. In recent years, however, a modest amount of precious- and base metal exploration has been taking place.

Industrial Minerals

The following narrative information was provided by the Wyoming State Geological Survey[2] (WSGS). Bentonite production continued to increase in Wyoming. In 1996, a bentonite plant near Lovell was reopened following an 8-year closure.

In Wyoming, natural soda ash is produced from the underground mining of trona ore. Trona production in Wyoming is expected to set a new record in 1996, increasing beyond the record 16.4 million metric tons[3] mined in 1995. The South Korean company that acquired a major interest in the former Rhône-Poulenc Mine and plant in 1995 announced a major expansion in 1996. The name of the soda ash producing company became OCI Chemical Corp. FMC Wyoming Corp. completed a major expansion of its soda ash refining plant, which increased the capacity of the plant by 25%. Tg Soda Ash Inc. operations announced plans to construct a new shaft to supply its existing plant with trona. The new mine shaft would be used to mine bed 17. The current mine operates in beds 19 and 20. Solvay Minerals Inc. announced a major expansion project at its soda ash plant, which will increase its capacity to the same as FMC, which has been the largest producer in the basin. Wold Trona Co. is continuing with plans for the construction of a sixth trona mine and refining plant. Wold plans to produce a product called benetron at its plant. Benetron is an acronym for beneficiated trona and can be used in applications not requiring as high a purity as that of regular soda ash. Benetron is about 96%- to 97%-pure soda ash, with regular soda ash being 99+% pure. The U.S. Bureau of Land Management held two trona lease sales in Wyoming in 1996. A total of 10 tracts were leased for a total bonus bid of $27 million. Successful bidders included General Chemical, Solvay Minerals, Church and Dwight, and Rock Springs Realty Co., a subsidiary of Union Pacific Corp. These 10 tracts contain more than 454 million tons of minable trona.

Diamond exploration in the Wyoming craton continued throughout 1996. To date, more than 100 kimberlitic intrusives have been identified in the Colorado-Wyoming kimberlite province. Approximately 35 kimberlites occur in the State Line district to the south of the craton. More than 120,000 diamonds have been recovered from kimberlites in this district to date.

Within the district, Redaurum Ltd. began operations at its Kelsey Lake Mine in May with a mill rated at 195 tons per hour. To date, the mine has produced several high-quality gemstone diamonds including four of the largest (6.2, 9.4, 14.2, and 28.3 carats) ever recovered in the United States. The 28.3-carat stone, a yellow gemstone the size of a thumbnail, is the fifth largest verified stone found in the United States. This mine is just across the State line in Colorado. Just over the border in Wyoming, exploration for diamonds has been taking place for a number of years because Wyoming shares some of these same and other related formations and because of the proximity of some of the Kelsey Lake Mine deposits. Aeromagnetic surveys of the district in Wyoming were planned for the first half of 1997.

Elsewhere in the district, Royal Gold announced the recovery of kimberlitic indicator minerals during a recent exploration program on Union Pacific Railroad lands. The company reported encouraging results, which suggested the presence of kimberlite and a "potential for the discovery of new diamond occurrences where kimberlites had not been previously identified." The company yielded indicator minerals in 17 of 73 stream-sediment samples.

To the north of the State Line District, other discoveries were reported as followup studies to anomalies earlier identified by the WSGS. One consultant reported finding two new kimberlites in the Sybille Canyon area north of Laramie, and a company reported the recovery of micro diamonds in sediment samples in the same region.

In November, Guardian Enterprises Ltd. announced the discovery of 10 kimberlitic diatremes and associated dikes in southwestern Wyoming. This is the first report of kimberlitic intrusives in this region; although kimberlitic indicator minerals have been known in the Cedar Mountain region for nearly two decades, and lamproites have been known to occur in the Leucite Hills to the northeast and in the Kamas, UT, region to the southwest. Guardian also reported finding three diamonds associated with the kimberlite pipes. Geochemical studies of the host rocks by the WSGS suggest possible affinity for lamproite rather than kimberlite, although the studies are continuing.

Guardian continued working in a 620-square-kilometer area in the Green River Basin. The basin includes a 2,600-square-kilometer anomaly characterized by the presence of kimberlitic indicator minerals. In a September press release, Guardian reported finding 48 alluvial diamonds from a new source other than the breccia pipes. The diamonds were reported to weigh a total of 2.3 carats and were recovered from 90 kilograms of material. Other activity in the basin was reported by Silver Sage Resources, MK Gold, Royal Gold Inc., and Primus Resources.

The production of cut and polished pieces of Wyoming Raven and Fantastico (stone) continues at Sunrise Stone's quarry and fabricating plant. Western Aggregates, of Boulder, CO, purchased decorative rock from Abbott Construction of Wheatland and from the Rawhide Ranch south of Lusk. An Italian stone producer has been exploring for decorative rock and is currently developing financing for fabricating plants for dimensional limestone and dimensional granite.

In November, Guernsey Stone, a division of Peter Kiewit Inc., purchased the property known as MS 108, about 3 kilometers north of the existing Guernsey Stone Quarry near Guernsey. Guernsey Stone quarries both construction and decorative aggregate at their quarry. MS 108 consists of multicolored dolomitic marble similar to the product from the existing quarry. The WSGS included MS 108 in its report published in 1991 entitled "Decorative Stones of Wyoming."

V. A. Resources (VA), of Casper, WY, acquired both the Plumbago Creek silica deposit in Albany County and the Cassa silica deposit in Platte County. VA constructed access roads and conducted an exploratory drilling program on the Plumbago Creek deposit in November and planned the beginning of a similar program on the Cassa deposit for December. The WSGS conducted initial exploratory drilling and mapping programs on both of these deposits in 1987 and 1988, respectively. The WSGS reports were used by VA in locating these resources and in the development of their mining plans. Additionally, adjacent to the silica sand deposit at Plumbago Creek in Albany County, VA constructed access roads and conducted exploratory drilling on a limestone resource. VA planned to begin quarrying this resource as early as late December 1996.

Mountain Cement Co.'s second kiln became operational in the spring of 1996, nearly doubling the capacity of their Laramie cement plant.

U.S. Zeolite applied for a zoning permit to construct a pilot plant at Bitter Creek, southeast of Rock Springs in Sweetwater County. This plant will process zeolites from the Fort La Clede deposit southeast of Bitter Creek.

In 1996, the WSGS hosted the 32d Annual Forum on the Geology of Industrial Minerals. This event was held in Laramie in May, with about 200 in attendance.

Metals

The Wyoming Department of Environmental Quality recently contracted Harrison-Western to reopen the drainage adit (a horizontal passage from the surface into a mine) of the historic Ferris-Haggarty Mine in the Encampment district in the Sierra Madre of southeastern Wyoming. The reopening of the mine is designed to identify the source of cupriferous waters draining from the mine and to attempt to stop the flow of the water into Haggarty Creek. Several years ago, an Exxon Minerals sampling program in a portion of the underground workings identified significant mineralization. Samples yielded 0.10% to 21.3% copper, 1.1 parts per million to 80 grams per metric ton silver, and 75 parts per billion to 11 grams per metric ton gold. Reserves reportedly included 842,000 metric tons of ore averaging 6.5% copper containing 3,600 kilograms of gold. Of historical note, the Ferris-Haggarty Mine was a copper producer in the early 1900's. Records indicate the mine produced more than 9,500 metric tons of copper with some gold and silver from Proterozoic Age quartzite breccia along a contact with a hanging wall felsic schist. Ore shoots were reported to average 6% to 8% copper in the historic mine and to average 6 meters in thickness with swells as thick as 20 meters. High-grade ore yielded as much as 30% to 40% copper.

Mountain Lake Resources signed a letter of intent to form a joint venture with Compass Minerals for exploration and development of the Copper King gold-copper property, 29 kilometers west of Cheyenne. According to a news release, Compass Minerals identified proven and probable reserves of 23 million tons of 0.82 grams per ton gold and 0.19% copper within a larger resource. Three other prospective anomalies were identified within a 3-kilometer radius of the property.

Cominco American Inc. and BHP Minerals were reportedly exploring for massive sulfides at various localities around the State. Other activity was reported by several companies searching for Cu-Ni-Co-precious metal mineralization as a followup to the WSGS's discovery of significant mineralization in the Puzzler Hill layered complex in the Sierra Madre of southeastern Wyoming.

Exploration and property acquisition was reported by Newmont Gold in the South Pass greenstone belt. No other information was available.

Production of uranium, a fuel mineral, increased as the current producers completed their expansion projects. Wyoming was the Nation's leading producer of yellow cake in 1995 and continued to lead the Nation in 1996. Uranium continued to be mined in Wyoming by in situ methods at Cogema Inc.'s operations at the Christensen Ranch Mine in Johnson County and Power Resources operations at the Highland and Morton Ranch properties in Converse County. Other companies with mining plans for properties in Wyoming include Kennecott Uranium, for an underground mine on Green Mountain, south of Jeffrey City in Fremont County; Rio Algom, which is developing the Smith Ranch property in Converse County for in situ production; Energy Fuels Nuclear, which is investigating the Reno Ranch property in southern Campbell County for in situ development; CAMECO, which is investigating properties in the Red Desert area of Sweetwater County and the Boot Heel area of Albany County; and Power Resources, which has applied for a permit to construct an in situ mine and recovery plant in the Gas Hills in Fremont County. Near the end of the year, CAMECO purchased Power Resources from its British owners. No changes in plans have been announced for the existing Power Resources operation. Further information on uranium in Wyoming may be obtained by contacting the WSGS.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at http://minerals.er.usgs.gov/minerals/contacts/comdir.html

[2] Ray E. Harris, Industrial Minerals and Uranium Geologist, and W. Dan Hausel, Senior Economic Geologist (Metals), both of the WSGS, coauthored the text of Wyoming mineral industry information submitted by that agency.

[3] All tons are metric unless otherwise specified.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WYOMING 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays	2,530 3/	91,300 3/	2,970	89,900 3/	3,210	95,700 3/
Gemstones	NA	13	NA	11	NA	W
Sand and gravel (construction)	3,210	13,100	3,860	17,500	3,100	13,200
Stone (crushed)	5,040	29,700	4,670	27,500	4,500	26,800
Combined value of cement (portland), clays (common), gypsum (crude), helium (Grade-A), lime, soda ash, and value indicated by symbol W	XX	746,000	XX	838,000	XX	783,000
Total	XX	880,000	XX	973,000	XX	918,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; included with "Combined values." XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value" data.

TABLE 2
WYOMING: 1/ CRUSHED STONE 2/ SOLD OR USED BY PRODUCERS IN 1995, BY USE 3/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch): Riprap and jetty stone	W	W	$9.33
Coarse aggregate, graded:			
Concrete aggregate, coarse	75	$615	8.20
Bituminous aggregate, coarse	24	201	8.38
Bituminous surface-treatment aggregate	W	W	2.50
Railroad ballast	W	W	5.38
Fine aggregate (-3/8 inch): Stone sand, concrete 4/	17	148	8.71
Coarse and fine aggregates:			
Graded road base or subbase	686	2,470	3.60
Other construction materials 5/	132	1,930	14.63
Special:			
Mine dusting or acid water treatment	9	239	26.56
Whiting or whiting substitute	3	97	32.33
Other fillers or extenders	37	1,370	37.14
Other specified uses not listed	(6/)	5	22.28
Unspecified: 7/			
Actual	3,090	16,700	5.42
Estimated	598	3,650	6.10
Total	4,670	27,500	5.88

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ To avoid disclosing company proprietary data, "District tables were not produced in 1995."

2/ Includes granite, limestone, limestone-dolomite, marble, miscellaneous stone, quartzite, and volcanic cinder and scoria.

3/ Data are rounded to three significant digits; may not add to totals shown.

4/ Includes stone sand (bituminous mix or seal).

5/ Includes roofing granules and terrazzo and exposed aggregate.

6/ Less than 1/2 unit.

7/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
WYOMING: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1994				1995			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value r/	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	9	1,470	$5,810	$3.96	12	1,550	$6,430	$4.15
Marble	1	93	3,250	34.90	1	90	3,110	34.51
Granite	3	3,410	19,900	5.84	3	2,960	17,200	5.81
Quartzite	1	W	W	10.92	4	W	W	11.36
Volcanic cinder and scoria	1	W	W	11.42	1	W	W	11.25
Miscellaneous stone	1	W	W	18.33	1	11	67	6.09
Total	XX	5,040	29,700	5.90	XX	4,670	27,500	5.88

W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes limestone-dolomite, reported with no distinction between the two.

TABLE 4
WYOMING: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate and concrete products 2/	634	$3,300	$5.21
Asphaltic concrete aggregates and other bituminous mixtures	W	W	9.12
Road base and coverings	1,370	5,430	3.96
Fill	328	1,230	3.75
Snow and ice control	W	W	8.94
Other	376	3,390	9.02
Unspecified: 3/			
Actual	645	2,880	4.47
Estimated	503	1,300	2.58
Total or average	3,860	17,500	4.55

W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
WYOMING: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	391	1,920	242	1,380
Asphaltic bituminous mixtures	W	W	W	W
Road base and coverings	805	3,160	565	2,270
Fill	113	394	216	837
Snow and ice control	W	W	W	W
Other miscellaneous uses	212	1,230	164	2,160
Unspecified: 3/				
Actual	634	2,850	10	34
Estimated	390	1,010	113	284
Total	2,540	10,600	1,310	6,960

W Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

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